The Journal of Parasitology

Volume XX DECEMBER, 1934 Number 6

PROGRAM AND ABSTRACTS OF THE TENTH ANNUAL MEETING OF THE AMERICAN SOCIETY OF PARASITOLOGISTS

PITTSBURGH, PENNSYLVANIA

DECEMBER 27, 28 and 29, 1934

PROGRAM[1]

THURSDAY MORNING SESSION, DECEMBER 27, 10:00 A. M.; ROOM 1001 CL, UNIVERSITY OF PITTSBURGH.

Read

1. The Guinea-Pig Nematode, *Paraspidodera uncinata.* (15 min.) D. A. Porter and G. F. Otto, Johns Hopkins University.

2. Strains of *Nippostrongylus muris* and Their Behavior in Various Strains of Rats. (12 min.) (Lantern.) George L. Graham and Dale A. Porter, Rockefeller Institute for Medical Research and Johns Hopkins University.

3. Resistant and Susceptible Strains of White Minorca Chickens to the Nematode *Ascaridia lineata* (Schneider). (12 min.) (Lantern.) J. E. Ackert and J. H. Wilmoth, Kansas State College.

4. Filarial Infection in the Marmosets (*Saimiri örstedii örstedii* and *Leontocebus geoffroyi*). (10 min.) (Lantern.) Ernest C. Faust, Tulane University.

5. Observations on the Status of Certain Genera of Acanthocephala, Chiefly from Birds. (15 min.) (Lantern.) (Also by demonstration.) H. J. Van Cleave, University of Illinois.

6. Some Ecto-Parasitic Trematodes of Puget Sound Fishes. (15 min.) John E. Guberlet, University of Washington.

7. Variations in *Plagitura salamandra.* (7 min.) (Lantern.) Ruth Shaw Kelley, University of Pittsburgh and Kent State College.

8. The Life Cycle of the Yellow Grub of Fish, *Clinostomum marginatum* (Rud.) (15 min.) (Lantern.) George W. Hunter, III, and Wanda S. Hunter, Wesleyan University.

9. The Germ Cell Cycle in Trematodes. (15 min.) (Lantern.) A. E. Woodhead, University of Michigan.

By Title

10. The Effect of Daily Administrations of Ferrous Sulphate and Copper Sulphate to Pigs on Their Resistance to Infection with the Swine Nodular Worm, *Oesophagostomum dentatum.* L. A. Spindler, U. S. Bureau of Animal Industry.

11. Resistance of Rats to Superinfection with *Nippostrongylus muris,* Following Administration of Adult Worms by Duodenal Tube. L. A. Spindler, U. S. Bureau of Animal Industry.

12. Development of *Ancylostoma caninum* Following Percutaneous Infection. Benjamin Schwartz and Joseph E. Alicata, U. S. Bureau of Animal Industry.

[1] An alphabetical author index will be found at the end of the program.

13. A Note on the Life History of a Trematode, *Eustomos chelydrae* MacCallum, 1921. Wendell H. Krull, U. S. Bureau of Animal Industry.

14. Experiments and Observations on the Life Cycle of *Halipegus occidualis* (Stafford, 1905). Lyell J. Thomas and Arthur D. Johnson, University of Michigan Biological Station and University of Illinois.

15. The Lymph System of *Sphyranura oligorchis*. C. H. Alvey and W. E. Martin, Purdue University.

16. *Taenia asiota* n. sp. From the Screech Owl. C. H. Alvey and K. E. Kintner, Purdue University.

17. The Life History of the Black Grub of Bass, *Crassiphiala ambloplitis* (Hughes). George W. Hunter, III, and Wanda S. Hunter, Wesleyan University.

THURSDAY AFTERNOON SESSION, DECEMBER 27, 2:00 P. M., ROOM 1001 CL, UNIVERSITY OF PITTSBURGH.

Read

18. Immunity in Rabbits Against One of its Cestode Parasites, *Cysticercus pisiformis*. (15 min.) (Chart.) K. B. Kerr, Washington University.

19. Experimental Amebic Infection in Reptiles. (15 min.) (Lantern.) Herbert L. Ratcliffe and Quentin M. Geiman, Zoological Society of Philadelphia and University of Pennsylvania.

20. Cultivation and Cross-Infection Experiments with *Balantidium*. (15 min.) (Lantern.) E. Clifford Nelson, University of Maine.

21. Periodicity in the Oocyst-Production of the Pigeon *Eimeria*. (5 min.) (Lantern.) Donald C. Boughton, Rockefeller Institute for Medical Research.

22. The Development of Resistance to the Protozoan Parasite *Eimeria tenella* by the Chicken. (12 min.) (Lantern.) C. A. Herrick, University of Wisconsin.

23. Histopathology of the Caecal Type of Coccidiosis in the Chicken. (15 mins.) (Lantern.) (Also by demonstration.) Roy L. Mayhew, Louisiana State University.

24. Trichomonas Vaginitis. (15 min.) (Lantern.) John F. Kessel and James A. Gafford, Jr., University of Southern California.

By Title

25. Chronic Avian Coccidiosis. W. T. Johnson, Oregon Agricultural Experiment Station.

26. The Incidence of Coccidia in the Common English Sparrow (*Passer domesticus*). Louis V. Skidmore, University of Nebraska.

27. Four Races of *Retortamonas intestinalis*. Mary J. Hogue, University of Pennsylvania.

28. Quantitative Studies of Experimental Infections with *Balantidium coli* in the Rat. Arnoldo Gabaldon, Johns Hopkins University.

FRIDAY MORNING SESSION, DECEMBER 28, 9:30 A. M., ROOM 817 CL, UNIVERSITY OF PITTSBURGH.

JOINT PROGRAM WITH THE AMERICAN SOCIETY OF ZOOLOGISTS, under the direction of W. H. Taliaferro; invited papers on "The Immunology of Parasitic Infections." Discussion led by W. H. Taliaferro.

Read

29. Resistance and Susceptibility in Coccidial Infections. (15 min.) (Lantern.) (Charts.) Justin Andrews, Johns Hopkins University.

30. The Nature of Immunity in Coccidiosis. (15 min.) (Lantern.) Elery R. Becker, Iowa State College.

31. The Effect of an Increased Burden of Phagocytosis Upon Natural and Acquired Immunity to Bird Malaria. (15 min.) (Lantern.) Wendell Gingrich, University of Chicago.

32. The Development of Adult Trichinae in Chick and Rat Embryos. (15 min.) O. R. McCoy, University of Rochester.

33. The Interrelations of Parasite and Host-Tissue in Experimental *Strongyloides* Infection. (15 min.) (Lantern.) Ernest C. Faust, Tulane University.

34. Experiments on the Passive Transfer of Immunity to an Intestinal Nematode Infection, and its Bearing on Local Immunity. (15 min.) (Lantern.) Asa C. Chandler, Rice Institute.

Presidential Address, 11: 30 A. M.

35. "Viewpoints and Orientation in Parasitology," E. E. Tyzzer, Harvard University Medical School. (The Presidential address will be published in the February, 1935, number of the JOURNAL OF PARASITOLOGY.)

FRIDAY NOON, DECEMBER 28, HOTEL SCHENLEY.

12: 30 PARASITOLOGISTS' LUNCHEON, for members and guests.
1: 30 ANNUAL BUSINESS MEETING.

FRIDAY AFTERNOON SESSION, DECEMBER 28, 3: 00 P. M.; ROOM 928 CL, UNIVERSITY OF PITTSBURGH.

By Demonstration

5. Observations on the Status of Certain Genera of Acanthocephala, Chiefly From Birds. (Also read.) H. J. Van Cleave, University of Illinois.

23. Histopathology of the Caecal Type of Coccidiosis in the Chicken. (Also read.) Roy L. Mayhew, Louisiana State University.

36. How Many Species of Avian Malaria Parasites Are There? Reginald D. Manwell, Syracuse University.

37. *Endamoeba histolytica* and Other Protozoa in Wild Rats Caught in Baltimore. Justin Andrews, Johns Hopkins University.

38. Species of *Capillaria* parasitic in the Upper Digestive Tract of Domestic and Game Birds. Eloise B. Cram, U. S. Bureau of Animal Industry.

39. *Alaria canis* n. sp. (Alariidae), a Trematode Parasite of the Dog in Northern Ontario. G. R. La Rue and A. M. Fallis, University of Michigan and Ontario Research Foundation.

40. *Acanthatrium molossidis* n. sp. From the Bat *Molossus sinaloae*. W. E. Martin, Purdue University. (Introduced by C. H. Alvey).

41. *Cercariaeum nephroplexis* n. sp. From *Helix albolabris* and a Redescription of *Cercariaeum vagans* (Leidy 1850) Diesing. W. E. Martin, Purdue University. (Introduced by C. H. Alvey).

42. Spermatogenesis in the Gasterostomes. A. E. Woodhead, University of Michigan.

43. Reproduction in *Leucochloridium*. A. E. Woodhead, University of Michigan.

44. The Life Cycle of *Typhlocoelum cymbium*. H. W. Stunkard, New York University.

45. The Life History of *Himasthla quissetensis* (Miller & Northup, 1928). H. W. Stunkard, New York University.

SATURDAY MORNING SESSION, DECEMBER 29, 10: 00 A. M.; ROOM 1001 CL, UNIVERSITY OF PITTSBURGH.

Read

46. The Effect of Various Culture Filtrates on the Pathogenicity of *E. histolytica* for Kittens. (15 min.) (Lantern.) William W. Frye and Henry E. Meleney, Vanderbilt University.

47. Iron Conservation and Utilization by Dogs with Hookworm Anemia. (10 min.) S. X. Cross, Johns Hopkins University.

48. Conjunctival Ophthalmomyiasis Caused by *Oestrus ovis*. (7 min.) (Lantern.) M. W. Lyon, Jr., South Bend Clinic.

49. A Destructive Outbreak of the Screw Worm Fly, *Cochliomyia* spp. in the Southeast. (12 min.) (Lantern.) F. C. Bishopp, U. S. Bureau of Entomology & Plant Quarantine.

50. Dikes and Automatic Tide Gates in Control of Sand Flies and Salt Marsh Mosquitoes. (15 min.) W. E. Dove and D. G. Hall, U. S. Bureau of Entomology and Plant Quarantine.

51. Epizootic Tick-Borne Tularaemia in Sheep in Montana, 1934. (25 min.) (Lantern.) Cornelius B. Philip, Rocky Mountain Laboratory, U. S. Public Health Service. (Invited paper.)

By Title

52. Parasites Found in an Examination of 150 Junior High School Students in the District of Columbia. Joseph E. Alicata, U. S. Bureau of Animal Industry.

53. Production of Maggots for Surgical Use. I. Disinfection of Eggs. G. F. White, U. S. Bureau of Entomology.

54. Biological Notes on *Uranotaenia* spp. in Louisiana. E. Harold Hinman, Louisiana State University.

AUTHOR INDEX

Showing program number, which is also abstract number of each paper.

Author	*Program & Abstract Number*		*Author*	*Program & Abstract Number*		
Ackert, J. E.	3		Kelley, Ruth S.	7		
Alicata, Joseph E.	12	52	Kerr, K. B.	18		
Alvey, Clifford H.	15	16	Kessel, John F.	24		
Andrews, Justin	29	37	Kintner, K. E.	16		
Becker, Elery R.	30		Krull, Wendell H.	13		
Bishopp, F. C.	49		La Rue, George R.	39		
Boughton, Donald C.	21		Lyon, M. W. Jr.	48		
Chandler, Asa C.	34		McCoy, O. R.	32		
Cram, Eloise B.	38		Manwell, Reginald D.	36		
Cross, S. X.	47		Martin, W. E.	15	40	41
Dove, W. E.	50		Mayhew, Roy L.	23		
Fallis, A. M.	39		Meleney, Henry E.	46		
Faust, E. C.	4	33	Nelson, E. Clifford	20		
Frye, William W.	46		Otto, G. F.	1		
Gabaldon, Arnoldo	28		Philip, Cornelius B.	51		
Gafford, James A., Jr.	24		Porter, D. A.	1	2	
Geiman, Quentin M.	19		Ratcliffe, Herbert L.	19		
Gingrich, Wendell	31		Schwartz, Benjamin	12		
Graham, George L.	2		Skidmore, Louis V.	26		
Guberlet, J.	6		Spindler, L. A.	10	11	
Hall, D. G.	50		Stunkard, H. W.	44	45	
Herrick, C. A.	22		Thomas, Lyell J.	14		
Hinman, E. Harold	54		Tyzzer, E. E.	35		
Hogue, Mary Jane	27		Van Cleave, H. J.	5		
Hunter, George W. III	8	17	White G. Franklin	53		
Hunter, Wanda S.	8	17	Wilmoth, J. H.	3		
Johnson, Arthur D.	14		Woodhead, A. E.	9	42	43
Johnson, W. T.	25					

ABSTRACTS

1. *The Guinea-Pig Nematode,* Paraspidodera uncinata. D. A. PORTER and G. F. OTTO, Johns Hopkins University.

Although the nematode, *Paraspidodera uncinata,* Travassos, 1914, has been repeatedly reported from guinea-pigs, heavy and general infestations apparently do not often occur in guinea-pig colonies. The writers, however, found one colony in which 61 of 114 pigs or 53.5% were infested. The infestations ranged from 1 to 95 worms with an average of 13.39. The ratio of ♀ to ♂ worms was 1.26 to 1. For the most part the ♂ pigs had heavier infestations than did the ♀. Eggs recovered from worms at autopsy developed to the vermiform stage in 3 to 5 days at room temperature (22–24° C.). Eggs reaching the vermiform stage in 3 days were shown to be infective 2 days later (no feeding experiments were performed earlier). Those reaching the vermiform stage in 5 days were shown to be infective 4 days later (no feeding experiments were performed earlier). Eggs stored in the refrigerator in the one cell and early morula stages 96 and 63 days respectively were still able to develop and to infect guinea-pigs. One young pig fed 60 embryonated eggs harbored only small immature worms (12♂♂, 9♀♀) when autopsied 40 days later. One pig (fed 300 eggs) showed eggs in its feces for the first time on the 66th day. Three ♂ and 14 ♀ worms were recovered from this pig.

2. *Strains of* Nippostrongylus muris *and Their Behavior in Various Strains of Rats.* GEORGE L. GRAHAM and DALE A. PORTER, Rockefeller Institute for Medical Research and Johns Hopkins University.

A newly isolated strain of *Nippostrongylus muris* was indistinguishable from old laboratory strains in respect to the length of time that active egg producing infestations were maintained when introduced into laboratory rats under comparable conditions. It appears that no process of adaptation is involved, nor is this attenuation a function of the number of worms present in moderate-sized infestations. Presumably it is associated with the youth of the rats employed. The comparison of worm strains was facilitated by utilizing group egg counts and worm counts conjunctively. After the egg curve peak (a relatively stable point) is passed, the egg production decreases for several days before worms are eliminated in large numbers. Autopsy after this peak reveals the number of worms involved, permitting establishment of an e/w ratio (eggs per day per rat divided by mean number of worms per rat) at the peak. By means of this ratio, a three year old strain of *N. muris* from Texas was consistently found to produce fewer eggs per worm than either of two Baltimore strains regardless of the rat strains in which they were tested. Similarly, this function (e/w ratio) revealed that rat strains vary in their control over egg production of *N. muris* infestations. Of three laboratory strains employed, the yellow-hooded rats suppressed egg production the most, the black-hooded somewhat less and the albinos the least. Laboratory-reared wild rats compared with pied laboratory rats show distinctive egg curves but do not appear to be more favorable hosts for *N. muris* than laboratory rats.

3. *Resistant and Susceptible Strains of White Minorca Chickens to the Nematode,* Ascaridia lineata *(Schneider).* J. E. ACKERT and J. H. WILMOTH, Kansas State College.

The results of two tests on the resistance of 187 chickens to the intestinal nematode, *Ascaridia lineata* (Schneider), in 1932–33 showed that White Minorca chickens were significantly more resistant to the growth of the *A. lineata* than were White Leghorn chickens. For example, the worms in the Minorcas averaged 19.03 mm. in length and those in Leghorns 23.83 mm., a difference of 4.80 mm. which was 9.72 times the probable error. On the other hand the results of two tests on 178 chickens during the following year showed that the White Minorcas from the same flock were significantly less resistant to the *A. lineata* than were the White Leghorns also from the same flock as before. Worms averaging 23.74

mm. occurred in the Minorcas and those averaging 20 mm. in the Leghorns, a difference of 3.74 mm. which was 4.37 times the probable error.

Comparisons of the weights of the chickens showed that those of the Leghorns had remained approximately the same whereas the weights of the Minorcas showed those of 1932–33 to be much heavier than the more susceptible ones of 1933–34. In fact, when the weights were examined, the first year Minorcas averaged 523 gm. and the second year ones 373 gm. The only change in the White Minorca flock, according to the owner, was that new cockerels were provided for the second year. Whether or not the progeny from these two flocks can be considered as different strains, they do have different genetic constitutions and as the evidence indicates the first year progeny were heavier and more resistant to the *A. lineata* than were the second progeny.

4. *Filarial Infection in the Marmosets* (Saimiri örstedii örstedii *and* Leontocebus geoffroyi) *in Panama.* ERNEST C. FAUST, Tulane University.

5. *Observations on the Status of Certain Genera of Acanthocephala, Chiefly from Birds.* HARLEY J. VAN CLEAVE, University of Illinois.

Several species of Acanthocephala ascribed to the genera *Polymorphus, Filicollis, Arhythmorhynchus, Corynosoma,* and *Bolbosoma,* show confusing intergradations of morphological characters which have been considered as of generic value. An undescribed species showing fundamental characters of the genera *Arhythmorhynchus* and *Corynosoma* suggests a reopening of the discussion of the limits of these genera. The intergradations will be pointed out and problems of interrelationships of the genera will be discussed.

6. *Some Ecto-Parasitic Trematodes of Puget Sound Fishes.* JOHN E. GUBERLET, University of Washington.

Studies on the ecto-parasitic trematode fauna of Puget South fishes have revealed some interesting facts. Two species of *Acanthocotyle* have been observed on the gills and skin of *Raja binoculata* (Girard) and *R. stellulata* (Jordan and Gilbert). Both species differ considerably in structure from those described by Monticelli (1899) as well as from *A. verrilli* Goto (1899). An apparently new species of *Rajonchocotyle* is of frequent occurrence on the gills of *R. binoculata. Squalonchocotyle somniosi* (Causey 1926) and *S. striata* (Miller 1927) occurr in abundance upon the gills of *Somniosus microcephalus* (Block) and *Squalus suckleyi* (Girard), respectively.

Megalocotyle marginata Folda is frequently encountered upon the gills of *Sebastodes caurinus* (Richardson) and *S. nebulosus* (Ayres). The various species of rock-fishes, *Sebastodes,* and the ling cod, *Ophiodon elongatus* (Girard), harbor at least three species of *Microcotyle. M. sebastis* Goto (1895) occurs on the gills of *S. caurinus.* Two of the species of *Microcotyle* are apparently new to science as indicated by important morphological structures in contrast with known species.

A hemiurid has been observed occurring on the gills of the humpback salmon, *Oncorhynchus gorbuscha* (Walbaum), and the sock-eye salmon, *O. nerka* (Walbaum). This trematode has been determined as the adult form of *Syncoelium filiferum* (Leuckart 1889). The description of Leuckart was based upon larval forms harboured by species of Euphausiidae collected during the Challenger Expedition. It is believed that this trematode on the gills of salmon is the adult stage of the immature form reported by Leuckart.

7. *Variations in* Plagitura salamandra. RUTH SHAW KELLEY, University of Pittsburgh and Kent State College.

Plagitura salamandra, an intestinal trematode of the vermillion-spotted newt, *Triturus viridescens viridescens,* seems to have a rather wide distribution. The following are percentages of infestations found: Seaton's Lake, Pa., 74.2; Gorley's Lake, Pa., 50.0; Massachusetts, 10.5; Ohio, 41.2; and Virginia, 66.6. The large

number of specimens obtained demonstrate great variations within the species. As to size, they vary—in length, from 1.055 to 3.376 mm., with 1.817 mm. as average, and in width, from 0.3798 to 0.9073 mm., with 0.5727 mm. as average. The gonads show a great range in size, shape and location. The testes measure from 0.05 to 0.23 mm. in diameter, and the ovaries from 0.06 to 0.21 mm. in diameter. The suckers vary in size, also. The oral suckers were from 0.105 to 0.23 mm. in diameter, and the acetabula were from 0.147 to 0.295 mm. in diameter. These specimens differ from Holl's description of the species as to certain details. All of these spcimens were found to have the anterior portion of the body covered with minute spines. Holl says there were no spines on his type specimens but those which he deposited in the U. S. N. M. collection (at Washington) show the same type of spination. In the present collection none was found to have an acetabulum 0.31 mm. in diameter, which is the measurement Holl gives. From this study it appears that the specific characters vary considerably. Much of this variation can be observed with specimens from a single host.

8. The Life Cycle of the Yellow Grub of Fish, Clinostomum marginatum (Rud.). GEORGE W. HUNTER, III, and WANDA S. HUNTER, Wesleyan University.

Experiments begun in 1930 culminated in a determination of the remainder of the life cycle in November, 1933. Adult parasites from the buccal cavity of the great blue heron shed mature eggs per os containing viable miracidia. These hatch immediately; undeveloped eggs hatch in 19 days. Miracidia (description in press) develop in two species of snail, *Helisoma antrosum* (Conrad) and *H. campanulatum* (Say). Mother sporocysts recovered from 11 to 21 days chiefly from the digestive gland of the snail. These were characterized by a thin cuticula covering a unicellular layer. Young sporocysts ranged from 0.17 to 0.28 mm. by 0.03 to 0.05 mm. in length and breadth respectively and carried 3 eye spots characteristic of miracidium.. Old mother sporocysts reached a maximum length of nearly 2 mm. Redia first appear in 26 days. Young stages possess, ovoid pharynx measuring 35 to 45 μ in length, a broad prominent intestine extending at least one third body length. Cercariae first encountered as mass of cells 45 to 70 μ in diameter. Maximum length of young and adult rediae 0.87 and 1.14 mm. respectively; latter possessed intestines extending to posterior tip. A few developed brevifurcate, pharyngeal furcocercous cercariae with fin folds were recovered in 27 days. This (described by Krull, July, 1934) penetrates *Eupomotis gibbosus.* Our data indicate six weeks required to develop metacercariae. Previous records (the Hunters, May, 1934) indicate metacercariae of *C. marginatum* mature in great blue heron in 4 days.

9. The Germ Cell Cycle in Trematodes. ARTHUR E. WOODHEAD, University of Michigan.

10. The effect of daily administrations of ferrous sulphate and copper sulphate to pigs on their resistance to infection with the swine nodular worm, Oesophagostomum dentatum. L. A. SPINDLER, U. S .Bureau of Animal Industry.

Test pigs were each fed, daily, 3.7 cc. of a dilute solution of ferrous sulphate and copper sulphate (560 mg. of each chemical dissolved in 1 gallon of water). Test and control pigs were given equal numbers of infective *Oesophagostomum dentatum* larvae, by mouth, to determine if these chemicals would modify the resistance of the animals to experimental infestation, or to the effects of infestation. Following experimental infestation the animals were killed and the nodular worms present post mortem were counted.

Test 1. Duration 12 weeks. The test pig gained 55.5 pounds and harbored 630 *O. dentatum.* The control gained 39 pounds and harbored 192 nodular worms.

Test 2. Duration 26 weeks. The test animal gained 129 pounds and harbored 134 nodular worms; the control gained 87.5 pounds and harbored 2 nodular worms.

Test 3. Duration 10.5 weeks. The test animal gained 48 pounds and harbored 995 *O. dentatum*. Three controls which gained 25, 37.5 and 18 pounds, respectively, harbored 76, 29 and 263 *O. dentatum*, respectively.

In these tests the copper-iron, as used, was apparently so beneficial to the swine as to offset any injurious effects from the large numbers of worms as the administration of this solution was correlated with larger numbers of worms and greater gains in weight, as compared to the untreated controls. On the other hand, the copper-iron apparently favored rather than inhibited the development of *O. dentatum;* this suggests a consideration of possible opposite effects on worms from "homeopathic" as opposed to "allopathic" doses of mineral anthelmintics.

11. Resistance of rats to superinfection with Nippostrongylus muris, *following administration of adult worms by duodenal tube.* L. A. SPINDLER, U. S. Bureau of Animal Industry.

Sexually mature males and females of *Nippostrongylus muris* taken from the intestines of experimentally infested rats, were administered to susceptible rats by means of the duodenal tube. After cessation of egg production the rats, together with controls from the same litters, were superinfected, percutaneously, with 500 *N. muris* larvae. Egg counts were made at regular intervals and the rats were killed and examined for worms after apparent cessation of egg output. No difference was noted in the prepatent periods of the worms in the superinfected and control rats. The maximum egg production of the worms in the superinfected rats varied from 800 to 13,600 eggs per gram of feces as contrasted to 3,000 to 98,000 eggs per gram of feces in the controls; in every case the egg production was greater in the worms from the controls. At necropsy, from 0 to 75 adult worms were found in the intestines and from 0 to 11 larvae were found in the lungs of the superinfected rats; from 3 to 70 adult worms were recovered from the intestines and from 1 to 12 larvae were recovered from the lungs of the control rats. This indicates that the administration of adult *N. muris* to these rats produced a resistance of a sort which inhibited egg production by the worms from a later percutaneous infection. The normal prepatent periods in the secondary infections and the small numbers of larvae in the lungs, recovered at necropsy, indicates that this resistance was localized in the intestines.

12. Development of Ancylostoma caninum *following percutaneous infection.* BENJAMIN SCHWARTZ and JOSEPH E. ALICATA, U. S. Bureau of Animal Industry.

The larvae of *Ancylostoma caninum* recovered from the lungs of guinea-pigs 3 days after infection through the mouth and 7 days after percutaneous infection, showed no evidence of having developed beyond the infective stage. Larvae from the lungs, trachea, esophagus, stomach and intestine of a dog killed 24 hours after percutaneous infection, were still in a stage morphologically indistinguishable from that of the infective larvae. Larvae recovered from the lungs, trachea, stomach, small and large intestines of another dog, killed 48 hours after experimental infection, had the same morphology as those noted above, with the exception of one larva from the stomach which showed the beginning of buccal capsule formation and of the first parasitic molt. In a third dog, killed 96 hours after percutaneous infection, the larvae present in the lungs and trachea, with a single exception, showed no evidence of development beyond that of the infective stage; one larva out of 19 larvae from the trachea was in the first parasitic molt. Most of the larvae from the stomach and small intestine were in the fourth stage; others were in the third stage. The absence of appreciable development of the larvae while they are in the lungs coupled with a rather rapid migration to the alimentary canal, affords a rational explanation of the more or less recently ascertained facts which indicate *A. caninum* develops in the intestine of dogs without migration to the lungs, following the ingestion of infective larvae.

13. A Note on the Life History of a trematode, Eustomos chelydrae *MacCallum, 1921.* WENDELL H. KRULL, U. S. Bureau of Animal Industry.

Xiphidiocercariae obtained from a naturally infested specimen of *Helisoma antrosa* were used to infect the snails *H. antrosa, H. trivolvis, Lymnaea traskii* and *Pseudosuccinea columella.* The metacercariae obtained from these snails were fed to a turtle, *Chelydra serpentina,* and approximately six weeks later fully mature flukes, which were identified as *Eustomos chelydrae* MacCallum, were obtained from the small intestine. When the cercariae escape from the snail they swim sluggishly in the water. On coming in contact with a suitable snail host they attach themselves to the head and crawl ventrolaterally until the mouth is reached. They then enter the mouth actively, shed their tails, penetrate the digestive tract, and become encysted. Encystment usually takes place in the foot or in the peri-esophageal connective tissue. The metacercariae grow considerably during the period of encystment. The second intermediate host snails and the turtle used in this investigation were raised from eggs under laboratory conditions.

14. Experiments and Observations on the Life Cycle of Halipegus occidualis (Stafford, 1905). Lyell J. Thomas and Arthur Dean Johnson, University of Michigan Biological Station and the University of Illinois.

The eggs of the fluke, *Halipegus,* embryonated when laid, contain a rather opaque miracidium 65 μ by 21 μ with one pair of flame cells; there are no cilia for locomotion but a heavy cuticular coat covered with pen-like alternating rows of spines, the most anterior of which are very large and serve as tissue penetrators. Eggs eaten by young *Physa parkeri* Currier develop parthenitae 107 μ to 165 μ by 24 μ to 30 μ outside the snail intestine in ten days. *Physa sayii crassa* Walker developed the orange banded rediae 805 μ to 200 μ containing cystophorous cercariae 76 μ in diameter one month after injecting the eggs. The cercaria proper about 150 μ long reached the infective stage in the body cavity of adult *Cyclops vulgaris* in 21 days attaining a size of 612 μ by 230 μ. Laboratory reared *Rana pipiens* tadpoles fed infected cyclops had immature *Halipegus* in the stomach when examined after 15 days; the flukes measured 787 μ by 262 μ. Newly metamorphosed *R. pipiens* and *R. clamitans* from nature had immature *Halipegus* in the lower oesophagus similar to those from experimental tadpoles and larger in the mouth with sex organs developed. Adult frogs of both species had mature flukes in the eustachian tubes. Infective metacercariae in copepods fed to various species of dragonfly nymphs were digested.

15. The Lymph System of Sphyranura oligorchis. C. H. Alvey and W. E. Martin, Purdue University.

Mature and immature specimens of *Sphyranura oligorchis* from *Necturus maculosus* were fixed in Helly's fluid and strained with haemotoxylin eosin. Frontal and sagittal serial sections were cut. The lymph system in the material examined consists of a single pair of longitudinal vessels which are located lateral and slightly dorsal to the intestinal ceca. These vessels extend from the region of the pharynx to a point just above the caudal lamina where they end as a sinus. At their anterior extremity they become much branched and end in sinuses which almost completely fill the portion of the body around the oral sucker and oral evagination. The lymph vessels anastomose in the region of the oral sucker. The walls of the lymph vessels appear to be entirely membranous in structure as neither nuclei or cell boundaries could be demonstrated. No previous account could be found concerning the occurrence of a lymph system in monogenetic trematodes.

16. Taenia asiota *n. sp. from the Screech Owl.* C. H. Alvey and K. E. Kintner, Purdue University.

Specimens of tapeworms taken from *Otus asio* differ from previously described forms in the size of scolex, suckers and hooks, number of testes and size and arrangement of the reproductive organs. These differential characters distinguish a new species for which the name *Taenia asiota* is proposed. The adults measure

from 35–40 mm. in length and 1.2–1.5 mm. in width. Scolex 0.38 to 0.42 mm. long, by 0.28–0.30 mm. in diameter. Well developed rostellum, diameter 0.1–0.13 mm.; hooks 0.045–0.055 mm. in length; 4 suckers unarmed, 0.1 mm. to 0.13 mm. in diameter. Anterior segments short; final segments about equal in length and breadth. Excretory canals connected in posterior region by transverse canal. Testes 28–32 in number, 0.09–0.1 mm. in diameter when fully developed. Cirrus pouch broadest at base, 0.11–0.14 mm. in length by 0.10–0.08 mm. in diameter. Genital pore irregularly alternating, vagina passing inward parallel to cirrus sac. Ovary bilobed, 0.13–0.16 mm. wide, 0.22–0.25 mm. long, located in posterior third of segment. In immature segments the central stem of the uterus develops dorsad and slightly anteriad in the median line and is branched in mature segments. Yolk gland located behind the ovary. Eggs numerous 0.04–0.05 mm. in diameter, with well developed onchospheres.

17. The Life History of the Black Grub of Bass, Crassiphiala ambloplitis (*Hughes*). GEORGE W. HUNTER, III, and WANDA S. HUNTER, Wesleyan University.

Experiments started in 1931 resulted in a partial elaboration of the life cycle at that time. The metacercariae, *Neascus ambloplitis,* when fed to young fledgling kingfishers yielded eggs in feces in 44 days and sexually mature flukes at autopsy at 47 and 50 days, (Hunter, 1933). Later eggs were hatched in about 3 weeks giving a miracidium characterized by 21 epidermal plates bearing cilia, numerous subepithelial cells, an apical gland (gut), two pigmented eye spots, 2 pairs of flame cells opening between the third and fourth rows of plates, germ ball, penetration glands and "brain." These forms penetrate *Helisoma trivolvis* (Say) and *H. campanulatum* (Say). Routine examination of "wild" snails yielded mother sporocysts about 0.3 mm. in length. Young unbranched daughter sporocysts possess a heavy wall and are slightly motile. Older sporocysts are over 2 mm. long; these are thin-walled and are frequently constricted in spots thus separating masses of developing cercariae. Emerging cercariae penetrate Centrarchid fishes. (Krull, 1934, infected *Eupomotis gibbosus* and *Apomotis cyanellus.*) In our experiments the characteristic black pigmented cysts appear about the inner hyaline cysts laid down by the parasite in 22 days in fingerling small-mouthed black bass, *Micropterus dolomieu.* Young rock bass and sunfish were also experimentally infected. A full account of this cycle is in press in the Supplement to the 24th Annual Report of the New York Conservation Department.

18. Immunity in Rabbits Against One of its Cestode Parasites, Cysticercus pisiformis. K. B. KERR, Washington University.

Rabbits were injected with *Taenia pisiformis* material and subsequently fed onchospheres of this species. The animals were autopsied 3 to 6 weeks after infection, during the period when the larvae were migrating from the liver to the mesenteries. Development of the larvae was totally inhibited in a few of the injected rabbits. Judging from the state of development and number of larvae found on the surface of the liver most of the injected rabbits showed some immunity. Thirty-three of the 44 immunized rabbits developed a relative immunity to this cestode. Superinfection experiments were performed. The larvae from the first infection were allowed to establish themselves on the mesenteries before the second infection was given. According to the criteria used in the active immunity experiments, an immunity to superinfection was established. Serum from rabbits with a single or a double infection injected into uninfected rabbits inhibited the development of larvae fed immediately after the injection. This is additional evidence that an immunity is established by infection.

19. Experimental Amebic Infection in Reptiles. HERBERT L. RATCLIFFE and QUENTIN M. GEIMAN, Zoological Society of Philadelphia and the University of Pennsylvania.

Water snakes, *Natrix rhombifer, N. cyclopion,* and *N. sipedon,* inoculated by mouth with four-day cultures (horse serum–0.5% saline 1 : 9 with rice starch containing cysts freed of trophozoites by refrigeration) of an *Endamoeba sp.* isolated 10–12 months earlier from lesions of acute intestinal and hepatic disease in *N. rhombifer,* died of a similar disease 20–30 days later. Water snakes, *N. rhombifer,* inoculated with four-day cultures (0.3% mucin–0.5% saline with rice starch containing cysts freed of trophozoites by refrigeration) of an *Endamoeba sp.* isolated 5 months earlier from liver abscesses in *Varanus salvator,* developed intestinal and hepatic disease 13–20 days later. Control animals were negative. In type and distribution, lesions were similar to those of snakes infected from unknown sources and dying at the Philadelphia Zoological Garden. Lesions in the colon apparently originate as surface erosions of the mucosa. All tissue elements may undergo necrosis accompanied by acute inflammatory response with fibrinous exudate and hemorrhage. Amebas enter the mucosa at any point and are usually found slightly in advance of the developing lesions. Blood vessels in the wall often contain thrombi and amebas. Intestinal disease is usually accompanied by lesions in the liver. These lesions are distributed throughout the organ without apparent relation to blood supply and lobular arrangement, and consist of areas of hyaline necrosis with hemorrhage. Inflammatory changes are inconspicuous. Amebas are found in all parts of the tissue and are abundant in blood vessels.

20. Cultivation and Cross-Infection Experiments with Balantidium. E. Clifford Nelson, University of Maine.

The Balantidia from the chimpanzee, pig, guinea-pig and *Macacus rhesus* monkey have been studied for the purpose of obtaining data on the following problems:

1. Susceptibility of rats to infection.
2. Reaction of the Balantidia from the pig and chimpanzee to extended residence in the rat.
3. Susceptibility to cultivation.
4. Reactions of the Balantidia from the pig and chimpanzee to extended cultivation.

Transfer to the rat was readily made with Balantidia from the pig and chimpanzee, yielding infections which lasted respectively 129 and 489 days. The species from the guinea-pig and *Macacus rhesus* did not become established in the rats. In the rat, the Balantidia from the pig and chimpanzee carried out their normal life-cycle with the exception of cyst production. Balantidia from the chimpanzee and pig were cultivated readily while those from the guinea-pig and *Macacus rhesus* were apparently unable to live in the same media and successful cultivation was not obtained. In culture the Balantidia from the chimpanzee and pig carried out the normal life-cycle except for the production of cysts. Peculiar abnormalities were observed and a study of them made. It is concluded that evidence was obtained showing a similarity between the pig and chimpanzee Balantidia and that the guinea-pig and *Macacus rhesus* forms are physiologically different from the Balantidia of the pig and chimpanzee.

21. Periodicity in the Oocyst-Production of the Pigeon Eimeria. Donald C. Boughton, Rockefeller Institute for Medical Research.

By means of oocyst counts on feces from 5 domestic pigeons collected at specific intervals for 7 days, it has been demonstrated that over 75 per cent of the daily oocyst-output takes place between 9 a.m. and 3 p.m., during which period only 25 per cent of the daily fecal output occurs. Less than 5 per cent of the oocysts are found in the fecal material (comprising over 50 per cent of the daily output) passed during the period 9 p.m.–9 a.m.

22. The Development of Resistance to the Protozoan Parasite, Eimeria tenella, *by the Chicken.* C. A. Herrick, University of Wisconsin.

Comparable numbers of oocysts of the parasite, *Eimeria tenella,* were administered to chickens of ten different ages, respectively 3, 10, 14, 30, 60, 90, 120, 210, 300 and 450 days. As judged by the hemoglobin content of the blood, death rate, erythrocyte count and leucocyte count, the chickens 90 days old or older were more resistant to infection than were the younger chickens. (Only the death rate was used as a measure of resistance in the 3 and 10 day old groups). The younger groups seemingly developed a resistance following infection as readily as did the older groups. The first generation of chickens raised from parents which were particularly resistant to coccidial infection were approximately 100 per cent more resistant to infection with coccidia than were chickens from unselected parents.

23. Histopathology of the Caecal Type of Coccidiosis in the Chicken. Roy L. Mayhew. Louisiana State University.

24. Trichomonas Vaginitis. John F. Kessel and James A. Gafford, Jr., University of Southern California and the Los Angeles County Hospital.

The etiology of the vaginal condition commonly designated as Trichomonas vaginitis has not been conclusively determined. Some think that *Trichomonas vaginalis* is the cause, others conclude that a streptococcus is responsible, while others feel a symbiotic relationship between bacteria and trichomonads is necessary. The histopathology of the lesions may be described as follows: Areas of infiltration are common in the submucosa and these contain collections of lymphocytes, a few plasma cells and some polymorphonuclear leucocytes. These areas show increased vascularity extending to the basement membrane in some instances and to the surface epithelium in other cases. The surface mucosa in certain areas is covered by coagulated material in which trichomonads, white cells and red cells are found. In some instances definite necrosis appears in these areas, the process extending from the submucosa toward the surface. Only occasionally has it been possible to find trichomonads in these areas of infiltration. Bacteriologic studies have shown alpha type streptococci and diphtheroids to be present in the majority of normal individuals as well as in cases demonstrating Trichomonas vaginitis. Transmission of these bacteria to normal vaginas has resulted in no pathogenic change. Transmission of exudate containing *Trichomonas vaginalis* and bacteria from cases of Trichomonas vaginitis to normal volunteers has resulted in typical symptoms. Transmission of cultures of *Trichomonas vaginalis* containing the same bacteria which were transplanted independently produced typical symptoms. Attempts to establish Trichomonas of the human intestine in the human vagina have met with negative results. Attempts to establish human *Trichomonas vaginalis* into the intestinal tracts of kittens have been negative. These findings indicate that *Trichomonas intestinalis* of man is not a common parasite of the vagina and that *Trichomonas vaginalis* is a species distinct from *Trichomonas intestinalis.*

25. Chronic Avian Coccidiosis. W. T. Johnson, Oregon Agricultural Experiment Station.

In an experiment pertaining to immunity, evidence of chronic infection was obtained incidental to other data. Fowls used were *Single Comb White Leghorns* hatched April 21, 1931, kept in cages equipped with one-half inch square mesh hardware cloth floors, up to August 7, 1931, and thereafter equipped with number eight wire arranged parallel and spaced one and one-quarter inches. Oöcysts (infective) of *Eimeria acervulina, E. mitis, E. maxima, E. praecox* and *E. tenella* were given on 229 days between August 7, 1931, and May 10, 1932. Five "immunized" and five susceptible control fowls of the same hatch, each in a separate cage, were given large doses of *E. praecox, E. mitis, E. acervulina* and *E. tenella,* March 18, 1933, April 13, May 4 and June 2, 1933, respectively. One control died from infection with *E. mitis* and the other four from *E. tenella.* One immunized fowl

died July 24, 1933, from chronic infection with *E. mitis*. *Eimeria mitis* oöcysts, more numerous than those from highly susceptible fowls following the usual incubation period for this species, were noted at irregular intervals up to 99 days after the April 13 inoculation. There was evidence of chronic infection with *E. mitis*, *E. acervulina* and *E. praecox* in other fowls, but not as conclusive as in the above case. Further investigations of such factors as age at which fowls become infected, dosage and genetics are necessary to determine relationships, if any, to chronicity. The common conceptions regarding chronic avian coccidiosis are not justified.

26. The Incidence of Coccidia in the Common English Sparrow (Passer domesticus). Louis V. Skidmore, University of Nebraska.

From 8–2–1928 to 2–2–1929, two hundred and thirty common English sparrows (*Passer domesticus*) were killed and examined for coccidia. Of these, 97.82 per cent were found to be infected with oöcysts of *Isospora lacazii*. No coccidia belonging in the genus *Eimeria* were found in any of the birds. This was determined by mixing the intestinal contents of six sparrows at a time with a 2 per cent $K_2Cr_2O_7$ solution in Petri dishes. At repeated intervals, for a period of eight days, this material was examined by the sugar flotation method. Fifty oöcysts were measured and they were found to vary in length from 18.75 μ to 30.00 μ and from 18.75 μ to 27.12 μ in width. The average length was 24.23 μ and the average width was 21.69 μ. The average shape-index was 0.895. No micropyle was seen. The wall was of a uniform thickness throughout. The oöcysts after being placed into a 2 per cent potassium bichromate solution at room temperature were observed to be completely sporulated in sixteen hours. At this time some granules are usually present in the oöcysts. Fifteen sporocysts were measured and they varied in length from 11.62 μ to 19.92 μ and from 8.30 μ to 11.62 μ in width. The average length was 15.71 μ and the average width was 10.24 μ. Each sporocyst contains a large granular residual body and a knob-like rostrum at the smaller end. Not any of the sparrows infected with coccidia showed macroscopic evidence of lesions of coccidiosis. The coccidia were most numerous in the duodenum. One hundred and thirty six English sparrows kept in a refrigerator 5 to 20 days at 5° C. did not prevent the *Isospora lacazii* from developing to the sporocyst stage when put into a 2 per cent $K_2Cr_2O_7$ solution at room temperature.

27. Four Races of Retortamonas. M. J. Hogue, University of Pennsylvania.

Four races of *Retortamonas intestinalis* are being studied. When the cysts are fixed in Schaudinn solution without acetic acid and are stained with iron haematoxylin, they have a dark cap at one end. All the races grow well in sodium chloride-sheep-serum-water. They live for several months in deep cultures covered with paraffin oil. The fixed cysts are from 4.–7.5 μ long and from 3.5–6 μ wide, there being a considerable variation in each race.

28. Quantitative Studies of Experimental Infections with Balantidium coli *in the Rat.* Arnoldo Gabaldon, Johns Hopkins University.

In white rats on an 85% carbohydrate diet, inoculated intracecally after laparotomy with approximately a thousand balantidia from the chimpanzee, and killed three, six and nine days later, the number of trophozoites found per trophozoite inoculated was subject to great variation. The averages for groups of rats killed at the times mentioned above were not significantly different, oscillating between 35 and 80, but in one animal the number exceeded three hundred. The total number of parasites found was also variable. Only 88.07% of the hosts showed protozoa when killed; in 6.5% of those which were positive the number found was not greater than the number originally introduced, but 72.7% had from 1000 to 100,000 individuals and 1.5% showed over 300,000. The numerical density of parasites, that is, the number per centigram of large intestine and contents, was likewise variable, 55.7% of the animals had under 100 trophozoites per centigram, 34.4% had from 100 to 500 and 4.3% showed 1000 to 1500. This density was not

influenced by the weight of the hosts used. Between the third and ninth day following the inoculation the density was not significantly different. The number of balantidia found per centigram of large intestine and contents did not appear to be markedly affected within certain limits by the number inoculated. In conclusion, little correlation was observed between the intensity of colonization and factors which might be expected to influence it.

29. *Resistance and Susceptibility in Coccidial Infections.* Justin Andrews, Johns Hopkins University.

Non-fatal coccidial infections are roughly divisible into those types in which the experience eventuates in the development of "immunity," and 2) in which the infection becomes patently chronic. In the first instances, the health of the host, if it has been affected, returns to normal, oocyst discharge diminishes to the point of negligibility, and the host is refractory to reinfection with the same species of coccidia. In the second instance, symptoms, if any, subside, but the host continues to discharge oocysts indefinitely, and in some instances at least is susceptible to subsequent infections with the same species of coccidia superimposed upon the original infection. Examples are given of each type. Exceptions to the normal course of events with "immune" animals are cited and their significance discussed. Resistance to coccidiosis is indicated not only by the degree of success with which a host rids itself of the infection but also by the varying intensity of primary infections manifested under conditions where oocyst ingestion and physical environment are comparable except for some deliberate experimental modification. The study of miniature epidemics of poultry coccidiosis has contributed useful items of information concerning this phase of resistance and susceptibility. The nature of these findings, their significance in understanding this portion of the protective mechanism, and their practical application will be discussed.

30. *The Nature of Immunity in Coccidiosis.* Elery R. Becker, Iowa State College.

Coccidial protein in parenteral injections, transfusions of immune blood, blocking of macrophages, attempts to passively transfer opsonins or bacteriophage, splenectomy, splenectomy and *Bartonella,* and exposure of the host to cold or heat do not alter the quantitative character of *Eimeria miyairii* infections in the rat. The feeding of comparatively small and comparatively large doses of the microorganism shows that the former leads to the development of immunity with the development of a comparatively small number of oocysts and the latter to the same result with the development of a significantly larger number of oocysts. Evidently the immunity is not to be explained by a generalized response on the part of the host organism. Since the relationship between the numbers of oocysts in the infective dose is not a direct one, it appears that the immunity is not the result of merely the depletion of available epithelial cells in the intestinal mucosa. If the immunity is a purely local defense reaction, the immune principle is capable of spreading from cell to cell, for the development of the immune state is attendant upon either a moderate number of parasites or an exceedingly large number, depending upon the size of the inoculating dose.

31. *The Effect of an Increased Burden of Phagocytosis upon Natural and Acquired Immunity to Bird Malaria.* Wendell Gingrich, University of Chicago.

Injections of 1 cc. 50 per cent foreign red cells (chicken, pigeon, duck) during different stages of infections of *Plasmodium cathemerium* in canaries served as a means of "blockading" the macrophage system. Daily injections for 3 days during the period of acute rise and for 6 days during the periods of incubation and acute rise (*i.e.* before the crisis) failed to changed the daily rate of increase (about 5X) in the number of parasites, although death and phagocytosis of 2/3 of the organisms is known to occur during this period. Daily injections for 3 days beginning at the crisis resulted in death of most birds. Daily injections for 3 days during recovery

(beginning 2 days after the crisis) resulted in marked increase in the number of organisms followed by death in about half the cases. Injections for 9 days during the latent period provoked relapse in every case, although the degree varied greatly. It has been demonstrated that phagocytosis of parasitized erythrocytes with proliferation and hypertrophy of macrophages accompanies the process of acquiring immunity to malaria. The results of "blockade" at the crisis and during the periods of recovery and latency constitute further evidence of the direct action of the macrophages in removing and destroying the parasites. In contrast to this, the failure of "blockade" to influence the natural immunity (as manifested by the two-thirds death-rate during the period of acute rise) indicates that phagocytosis during this period is not the factor which limits the daily rate of increase of the organisms.

32. *The Development of Adult Trichinae in Chick and Rat Embryos.* O. R. McCoy, University of Rochester.

Trichinella spiralis larvae, obtained free from infected rat muscle by artificial digestion, were sterilized without injury by suspending them in a 1 : 2,000 solution of merthiolate for 5 minutes. Approximately 1,000 sterile larvae were injected into the amniotic sac of chick embryos from 6 to 15 days old. About 40% of the embryos survived the inoculation and were examined from 2 to 7 days after the larvae were introduced. Worms in various stages of development up to sexual maturity were found in about 60% of the eggs in which the embryo still lived. In one instance, a female worm was found which had young larvae developing in the uterus. Only about 1 or 2% of the larvae injected underwent development, and the size attained by the sexually mature worms found after 6 or 7 days was much less than normal. In a second series of experiments with pregnant female rats, laparotomy was performed on what was estimated to be about the 14th day of gestation, and sterile larvae were injected through the uterine wall into the amniotic sac of the embryos. Practically all worms found in examinations made after from 2 to 5 days showed the same degree of development and increase in size that would be expected if they had grown in their usual intestinal habitat. On the 5th day after the injection, numerous female worms were found with young larvae developing in the uterus. So far, attempts to obtain development of the larvae in sterile amniotic fluid incubated *in vitro* have not been successful.

33. *The Interrelations of Parasite and Host-Tissue in Experimental* Strongyloides *Infection.* Ernest Carroll Faust, Tulane University.

Studies were conducted on 62 dogs infected with human and simian strains of *Strongyloides,* in an attempt to elucidate the progressive damage produced by the worm in the host and the tissue reactions provoked by the parasite. At the site of inoculation on the skin only fibroblastic repair was stimulated, except where dead or dying larvae became surrounded by polymorphonuclear leukocytes. On arrival in the alveoli and respiratory sacs of the lungs, acute leukocytic invasion of the air passages was initiated, but no phagocytosis occurred. The larvae, crowded in by the host tissue elements, proceeded to metamorphose into preadolescent and adolescent worms, and at times the females invaded the palisade epithelium of the bronchi. Young females which reached the small intestine invaded the mucosa, where many worms tunnelled into the interglandular stroma and oviposited. Adult females, eggs and larvae produced traumatic and lytic damage to the mucosal layer. This provoked a variety of host tissue reactions, including adventitious ensheathment of the worms and eventual phagocytosis, fibroblastic repair of damaged tissue and pseudo-tubercle formation around larvae attempting to penetrate into or beneath the muscularis mucosae.

34. *Experiments on the Passive Transfer of Immunity to an Intestinal Nematode Infection, and its Bearing on Local Immunity.* Asa C. Chandler, Rice Institute.

Experiments are reported on the effect of injection of immune and normal serum on the course of a *Nippostrongylus infection* in rats, on the transfer of immunity from mother to offspring, and on the transfer of immunity from one member to the other in a pair of parabiotic twins.

35. *Viewpoints and Orientation in Parasitology.* E. E. TYZZER. Harvard University.

Presidential address.

36. *How Many Species of Avian Malaria Parasites Are There?* REGINALD D. MANWELL, Syracuse University.

Although the earlier workers in the field of malaria believed that there were a number of species of avian malaria parasites, it was only recently that this was clearly demonstrated by Hartman, who described three. Since then others have been added, and a study of the literature indicates that in all probability still others exist. The author believes that the specificity of *Plasmodium cathemerium, circumflexum, elongatum, praecox* (*relictum*), *rouxi,* and *vaughani* (*tenue*) is well established. In addition to these, *P. capistrani* and *wasielewski* are probably valid, although the latter especially should receive more study. *Plasmodium biziurae, fallax, major, tumbayensis* and *majoris* may represent good species, but the original descriptions are incomplete so that no opinion can be passed as to their validity at present. A study of more than 300 birds, belonging to 22 species, caught (with three exceptions) in Syracuse, has resulted in the finding of four of the above species (*praecox, cathemerium, circumflexum, vaughani*), and a fifth also—*Plasmodium polare,* n. sp. The latter was found in a cliff swallow (*Petrochelidon lunifrons lunifrons* Say). It is characterized by elongate gametocytes, produces usually not more than 16 merozoites per segmenter (most often, 10 or 12), does not displace the nucleus of the host cell, and the larger asexual forms always occupy a polar position in the erythrocyte. Inoculation of massive doses of infected blood into canaries failed to produce any infection. Two strains of *vaughani,* apparently differing somewhat, were isolated from robins and a catbird respectively. It is certain, from cross-immunological studies, experimentation with drugs, and study of the type of infection produced, that this species is valid and differs from all the others, including *Plasmodium rouxi* (which it much resembles morphologically).

37. Endamoeba histolytica *and Other Protozoa in Wild Rats Caught in Baltimore.* JUSTIN ANDREWS, John Hopkins University.

A protozoan survey of wild rats caught principally in market places in Baltimore is reported to date. The fresh blood and intestinal contents of these animals were examined microscopically, stained preparations being made of cases where there was any uncertainty of diagnosis. Of 240 rats examined, *Endamoeba histolytica* was found in several instances, cysts and active trophozoites present in most cases. With the notable exception of *Hexamitus,* most of the protozoan species described from rats have been found to date, *Endamoeba muris, Trichomonas,* and *Trypanosoma lewisi* predominating.

38. *Species of* Capillaria *Parasitic in the Upper Digestive Tract of Domestic and Game Birds.* ELOISE B. CRAM, U. S. Bureau of Animal Industry.

Severe infestations with species of *Capillaria* have been observed as the apparent cause of death to wild ducks (pintails), pheasants, mountain quail, and turkeys, the location of the worms in each case being the upper digestive tract, where gross pathological effects were present; the outbreaks were distinct as to time and locality, no relation existing between them. In cross-transmission experiments, the capillarids from pheasants proved infective to a duck and a bobwhite quail but not to chickens; that from mountain quail proved infective to a bobwhite quail and to turkeys but not to chickens and guinea fowls; that from turkeys proved infective to turkeys but not to chickens, guinea fowls, ducks and a crow. A comparative

study has been made of morphological characteristics and pathological effects of these and other avian capillarids of the upper digestive tract.

39. Alaria canis *n. sp.* (*Alariidae*), *a Trematode Parasite of the Dog in Northern Ontario.* G. R. La Rue, University of Michigan, and A. M. Fallis, Ontario Research Foundation.

A trematode of the family Alariidae was recovered from a Newfoundland dog, at Cartier, Ontario, following anthelmintic treatment. Its form and structure are sufficiently different from other species of this family to justify erection of a new species under the name *Alaria canis.* Diagnosis: Body of typical shape, 3.2 mm. long; forebody 2.2 mm. long × 0.8 mm. wide; hindbody 1.0 mm. long × 0.9 mm. wide; tentacular appendages present; oral and ventral suckers about equal; prepharynx short; intestinal caeca not entering holdfast; latter of moderate size, not notched anteriorly, not on pedicel; adhesive gland lacking; vitellaria extending from acetabulum to hindbody and into latter as far as anterior testis on median ventral line; ovary amphitypic; oötype laterial to anterior testis; Laurer's canal present; seminal vesicle consisting of double transverse loop; ejaculatory pouch very muscular; strong sphincter muscles surround genital atrium; ascending limb of uterus has transverse loop between the two testes, also coils in posterior part of holdfast, descending limb tortuous, lying just below ventral surface; common genital duct opens into genital atrium near base of genital cone on its posterior side.

40. Acanthatrium molossidis *n. sp. from the Bat* Molossus sinaloae. W. E. Martin, Purdue University.

Specimens of *Acanthatrium* which were taken from the intestine of *Molossus sinaloae,* collected in Honduras, Central America are much larger than *A. nycteridis* Faust. In these worms the suckers are larger, eggs smaller, uterus more posteriad, and the reproductive organs are more laterad and posteriad than in *A. nycteridis.* These differences distinguish a new species, for which the name, *A. molossidis* is proposed. The type specimen measures 0.66 mm. in length by 0.67 mm. in width. Cuticula smooth; oral sucker terminal, 0.13 by 0.11 mm., prepharynx short; pharynx spherical, 0.05 mm. in diameter; oesophagus absent; ceca transverse. Testes spherical to oval, 0.14–0.17 mm. in diameter, situated laterad to the acetabulum. Ovary pyriform, 0.12–0.18 mm. in diameter located just behind the acetabulum on the left side. Genital pore just in front of the acetabulum slightly to the left of the median plane; genital atrium spined. Prostrate glands in spherical mass above the genital pore, vitellaria in front of the ceca. Uterus transverse, completely filling the post-acetabular region. Eggs elliptical, operculate, 0.02–0.03 mm.

41. Cercariaeum nephroplexis *n. sp. from* Helix albolabris *and a Redescription of* Cercariaeum vagans (*Leidy 1850*) *Diesing.* W. E. Martin, Purdue University.

Specimens of *Cercariaeum* taken from the liver of *Helix albolabris* collected in northern Indiana possess a well developed reproductive system and a complex excretory system. Vitellaria and gland cells around the ceca are absent. These differential characters distinguish a new species for which the name *C. nephroplexis* is proposed. The type specimen is 1.19 mm. in length, by 0.36 mm. in width, and is much flattened dorso-ventrally. Oral sucker terminal, 0.21 mm. in diameter. Digestive system triclad, prepharynx short, pharynx 0.09 mm. in diameter, oesophagus absent, intestinal ceca extend to the posterior end of body. The testes 0.07 mm. in diameter are located in the posterior fourth of the body on either side of the mid-line. The ovary 0.05 mm. in diameter is located between the testes. The uterus extends from the ovary to a point in front of the acetabulum, then coils back to the genital pore which is located just above the ovary. Tubes which probably become vitelline ducts in the adult extend laterad and anteriad from the oviduct. No vitellaria were present. Vasa efferentia unite to form the vas deferens which is coiled near the genital opening and ends in a slender cirrus. Excretory bladder cylindrical, opening posteriorly. The main excretory tubes extend to the

anterior end of the body and double back to the posterior end before dividing into a complicated network of tubules and flame cells. The flame cells are arranged in groups of four.

Cercariaeum vagans (Leidy 1850) Diesing was found in *Helix alternata* collected in Indiana. Some reproductive tubes are added to the original description.

42. *Spermatogenesis in the Gasterostomes.* ARTHUR E. WOODHEAD, University of Michigan.

Reproduction in the gasterostomes, with a brief description of the morphology of the hermaphroditic mother-sporocyst and hermaphroditic redia. The sections showing the most important features of the subject will be demonstrated.

43. *Reproduction in Leucochloridium.* ARTHUR E. WOODHEAD, University of Michigan.

Four colored mother-sporocysts of *Leucochloridium,* three of them new to the literature, will be described with notes on the ecology of the snail hosts. Structures, new to the subject, will be described, including early stages in the embryology of the redia. Many of these will be shown by demonstration. Also colored photographs of the mother sporocysts will be exhibited.

44. *The Life Cycle of* Typhlocoelum cymbium. H. W. STUNKARD, New York University.

A single specimen of *T. cymbium* (Diesing, 1850) Kossack, 1911, (= *Tracheophilus sisowi* Skrjabin, 1913) was found in the oronasal passages of a pied-billed grebe, *Podilymbus podiceps.* It was removed to isotonic salt solution for three hours and shed many eggs. When desposited each egg contains a fully formed miracidium and after 10–30 minutes the larvae begin to emerge. The miracidium contains a fully formed redia. If movements of the miracidium are prevented, the redia emerges. Laboratory raised specimens of *Lymnaea stagnalis, Physella heterostropha* and *Helisoma trivolvis* were placed in a dish with swimming miracidia and the snails were dissected at regular intervals after exposure. No specimens of *L. stagnalis* or *P. heterostropha* become infected. The rediae were recovered from *H. trivolvis* and the course of development was traced. There is no daughter redial generation. Cercaria develop in the rediae and emerge through a birth pore. They do not issue from the snail but encyst in the tissues near the body wall. As many as 30 metacercariae were recovered from a snail dissected 8 weeks after infection. A paper confirming and extending the reports of Szidat (1932, 1933) will be published in Bull. Soc. Zool. France.

45. *The Life History of* Himasthla quissetensis (*Miller & Northup, 1926*). HORACE W. STUNKARD, New York University.

Cercaria quissetensis Miller & Northup, 1926, is a parasite of *Nassa obsoleta* at Woods Hole; about one per cent of the snails are infected. Cercariae swim near the bottom of the water and encyst in the gills, foot and mantle of various molluscs. Metacercariae were obtained experimentally in *Mya arenaria, Mytilus edulis, Modiola modiolus, Cumingia tellinoides, Pecten irradians, Ensis americana* and *Crepidula fornicata.* The metacercariae were infective for birds three days after encystment and developed to maturity in gulls. Sexually mature worms appear to be identical with those described by Linton (1928) as *Himasthla elongata* (Mehlis). Since there are constant differences between these specimens and *H. elongata,* they can not be referred to that species and the name of the cercaria is adopted for them.

46. *The Effect of Various Culture Filtrates on the Pathogenicity of* E. histolytica *for Kittens.* WILLIAM W. FRYE and HENRY E. MELENEY, Vanderbilt University.

We have shown in a previous report (Frye and Meleney 1933) that removing most of the bacteria accompanying certain strains of *Endamoeba histolytica* in cul-

ture seemed to lessen the ability of the amoebae to produce lesions in inoculated kittens. Further observations with one of these strains have shown that horse serum-Ringer (1–6) added to the washed amoebae at the time of inoculation seems to reduce the percentage of infection in kittens as well as the average severity of the lesions. When Berkefeld filtrates of the amoeba culture were added to washed amoebae there was no such reduction in incidence or average intensity of infection. We have treated these filtrates in various ways for the purpose of determining if possible what constituents of the filtrates may be of assistance or inhibitory to the amoebae in the production of lesions.

47. *Iron Conservation and Utilization by Dogs with Hookworm Anemia.* S. X. Cross, Johns Hopkins University.

Fecal analysis of six anemic animals, on iron free diet, showed smaller total iron outputs than two normal controls also on iron free diet. One animal with haemoglobin index of 22 per cent was raised to a level of 48 per cent after six days of treatment with copper sulphate without addition of iron.

48. *Conjunctival ophthalmomyiasis Caused by* Oestrus Ovis. M. W. Lyon, Jr., South Bend Clinic.

Report of case of man being struck in eye by insect. Within next 10 hours 10 first stages larvae of *Oestrus ovis* were removed. One additional larva was seen to disappear down lacrimal duct. Larvae caused mechanical irritation of conjunctiva. No sequelae had developed after one month. The accident is probably much more common than recognized. It is suggested that the conjunctiva and lacrimal duct may be one of the normal modes of parasitizing animals.

49. *A Destructive Outbreak of the Screw Worm Fly,* Cochliomyia *ssp., in the Southeast.* F. C. Bishopp, U. S. Bureau of Entomology and Plant Quarantine.

The screw worm flies, *Cochliomyia* ssp. have been firmly established in the southwestern states for many years and are regarded there as a major pest of livestock. In 1933 for the first time destructive infestations were found in southern Georgia and northern Florida. In 1934 they again appeared in these two states over a much wider area and also in the states of South Carolina, Alabama, Mississippi and Louisiana. In all these states farmers and stockmen were totally unfamiliar with the problem and methods of handling it, in consequence of which the losses from death and injury were high. Many individual cases of attack were induced by primary attacks of the Gulf Coast tick, especially in the ears of sheep. The situation was aggravated to some extent by the shipment of freshly branded and earmarked cattle from drouth areas into the southeastern states. Urgent appeals for aid in controlling the outbreak were received by the Bureau of Entomology and Plant Quarantine from all parts of the infested territory. Arrangements were finally made whereby funds were to be allotted by the State Emergency Relief Administrations in Florida, Georgia and Mississippi. Under the direction of the Bureau of Entomology and Plant Quarantine a control program was instituted in these states. This involved an intensive educational campaign and the distribution of materials for treating infested livestock. The results have been encouraging.

50. *Dikes and Automatic Tide Gates in Control of Sand Flies and Salt Marsh Mosquitoes.* W. E. Dove and D. G. Hall, U. S. Bureau of Entomology and Plant Quarantine.

Sand fly and salt marsh mosquito breeding places are being eliminated at Savannah, Georgia, by the use of dikes fitted with automatic tide gates. The gates close to prevent tidal waters from entering the diked areas but open to permit surface drainage of these areas. In Chatham county where 36 principal breeding places were eliminated by dikes and automatic gates, there has been a marked reduction in the population of both sand flies and salt marsh mosquitoes. Isolations of sand fly larvae from soil samples and the sand flies emerging in field cages show

that actual drying of the breeding places either destroys sand fly larvae or concentrates them in the wet soil of the ditches. Observations on the populations of both sand flies and salt marsh mosquitoes suggest a reduction of 60 per cent to 75 per cent of the numbers usually encountered in this county. In view of the fact that only about 30 per cent of the work is completed in Chatham county, the results suggest a high degree of control.

51. *Epizootic Tick-Borne Tularaemia in Sheep in Montana, 1934.* CORNELIUS B. PHILIP, Rocky Mountain Laboratory, United States Public Health Service.

An explosive outbreak of disease occurred among sheep near Ringling, Montana, in April and May, 1934. Of 1320 yearling ewes approximately 40 per cent were symptomatically affected and 200 died before control measures were effective. Observations made locally showed (1) unusually heavy infestation of the sheep by ticks (*Dermacentor andersoni*), (2) appearance of illness following removal from winter to summer range with estimated incubation period of 8 to 10 days, (3) coincident mortality among tick-infested jack rabbits, and (4) occurrence of a human case of tick-transmitted tularaemia. Tularaemia infection was at least partially responsible as indicated by—(1) recovery of *Bact. tularense* from tissues of affected sheep and rabbits, (2) recovery of *Bact. tularense* from part of the infesting ticks on such animals, and (3) positive agglutination tests with sheep serums in titers roughly corresponding to severity of observed symptoms. Strains of *Bact. tularense* isolated from sheep and sheep ticks proved more virulent on test than those from rabbits and rabbit ticks. In view of the amount of tularaemia infection in ticks and animals shown to be present, 3 observations are particularly puzzling—(1) the failure to recover *Bact. tularense* from unfed ticks collected locally, (2) the failure of the owners, employees or investigators to become infected in spite of massive exposure to infected carcasses, ticks and feces-contaminated wool, and (3) negative aggultination tests of all serums of killed rodents, particularly jack rabbits. Supplemental information on tick and tick-host abundance and a brief illustrated résumé of clinical and pathological observations also are included.

52. *Parasites Found in an Examination of 150 Junior High School Students in the District of Columbia.* JOSEPH E. ALICATA, U. S. Bureau of Animal Industry.

In connection with a medical examination of Junior High School students in Washington, D. C., 150 boys, from 12 to 16 years of age, were examined for intestinal parasites during June, 1934. All of the stools were examined for helminth eggs, and 100 were examined for protozoa also; the salt-floatation method was used for recovering eggs from the feces, and stained preparations were made for the identification of the protozoa. Only 1 fecal specimen was examined from each student. The incidence of nematode infestation was as follows: *Enterobius vermicularis* 1.3 per cent; *Necator americanus,* 1.3 per cent; *Trichuris trichiura,* 2.7 per cent. The incidence of protozoa infestation was as follows: *Endamoeba coli,* 18 per cent; *Endamoeba histolytica,* 3 per cent; *Endolimax nana,* 19 per cent; *Iodamoeba butschlii,* 6 per cent; *Chilomastix mesnili,* 3 per cent; *Giardia lamblia,* 8 per cent. Of the two boys infested with hookworms, one had resided in Washington, D. C., continuously for 3 years and the other for 4 years; both boys had resided formerly in areas where hookworms were prevalent.

53. *Production of Maggots for Surgical Use. I. Disinfection of Eggs.* G. F. WHITE, U. S. Bureau of Entomology.

Maggots for stock flies are from disinfected eggs and are reared on autoclaved lung, liver, egg, yeast, and agar. Successive generations for more than a year of *Lucilia sericata* thus reared have been good egg producers. Eggs are separated in 2 per cent (commercial) sodium hydroxide, immersed in 5 per cent solution for 1.5 hours at 32° C., strained, washed with 0.02 per cent (commercial) hydrochloric

acid, and transferred to glass slides within vials containing food for maggots. Further to secure sterility of clinical maggots the hydroxide may be followed by another disinfectant. If formaldehyde is selected the hydroxide is decanted, the eggs are washed with 0.02 per cent formic acid, immersed in 2.5 per cent formaldehyde for 20 minutes at room temperature, strained, washed with distilled water, and transferred to maggot-rearing vials. If mercuric chloride is chosen as the second disinfectant, the eggs from the hydroxide are washed with 0.02 per cent hydrochloric acid, immersed in 1:2,000 acidulated alcoholic solution of the bichloride for 10 minutes, strained, washed, and transferred to rearing vials. In routine production of maggots no practical laboratory test is now available by which their absolute sterility can be demonstrated. However, by this method they are probably free from all spore-producing organisms and most of the non-spore-producing pathogenic ones. Freedom from the tubercle bacillus is not assured. Sterility is at least closely approximated. By the method, too, maggots are produced without disagreeable odor and at reduced cost. Bacterological technique is used throughout.

54. *Biological Notes on* Uranotaenia *spp. in Louisiana.* E. Harold Hinman, Louisiana State University.

Two species of these rare minute mosquitoes, *Uranotaenia sapphirina* and *U. lowii,* have been under observation in Louisiana for the past two years. Notes on their breeding habitats, life cycle, seasonal incidence, hibernation, etc., are presented. It is of especial interest that tremendous numbers of *Uranotaenia sapphirina* have been found hibernating throughout the winter in a deserted fort. Neither species has ever been induced to suck blood.

AMERICAN SOCIETY OF PARASITOLOGISTS

Officers for 1934

ERNEST E. TZZYER, Harvard University ..... *President*
JAMES E. ACKERT, Kansas State College ..... *Vice-President*
HORACE W. STUNKARD, New York University ..... *Secretary*
JUSTIN ANDREWS, Johns Hopkins University ..... *Treasurer*

Council Members at Large (with date of expiration of term)

1937 ELOISE B. CRAM, U. S. Department of Agriculture.
1937 WILBUR A. SAWYER, Rockefeller Foundation.
1936 H. E. MELENEY, Vanderbilt Medical School.
1936 NORMAN R. STOLL, Rockefeller Institute for Medical Research.
1935 J. F. KESSEL, University of Southern California.
1935 D. H. WENRICH, University of Pennsylvania.
1934 W. W. CORT, Johns Hopkins University.
1934 ERNEST CARROLL FAUST, Tulane University Medical School.

Representatives of the Society on the Council of the American Association for the Advancement of Science

ELERY R. BECKER
GEORGE R. LA RUE

Representatives of the Society on the Council of the Union of American Biological Societies

HARLEY J. VAN CLEAVE
DAVID H. WENRICH

Editorial Committee of the Journal of Parasitology

W. W. CORT, Chairman ..... to serve until 1937
WILLIAM H. TALIAFERRO ..... " " " "
*F. M. ROOT ..... " " " "

Editorial Board of the Journal of Parasitology

CHAS. F. CRAIG ..... to serve until 1937
ERNEST CARROLL FAUST ..... " " " "
BENJAMIN SCHWARTZ ..... " " " "
F. C. BISHOPP ..... " " " 1936
GEORGE R. LA RUE ..... " " " "
D. H. WENRICH ..... " " " "
J. E. ACKERT ..... " " " 1935
ELERY R. BECKER ..... " " " "
R. P. STRONG ..... " " " "
ASA C. CHANDLER ..... " " " 1934
CHARLES A. KOFOID ..... " " " "
WM. A. RILEY ..... " " " "

* Deceased, October 21, 1934.

LIST OF FORMER OFFICERS

	President	*Vice-President*
1925	Henry B. Ward	Samuel T. Darling*
1926	Charles W. Stiles	Charles A. Kofoid
1927	Richard P. Strong	Edwin Linton
1928	Charles A. Kofoid	Robert Hegner
1929	Nathan A. Cobb*	George La Rue
1930	William W. Cort	Ernest Carroll Faust
1931	William A. Riley	Asa C. Chandler
1932	Maurice C. Hall	William H. Taliaferro
1933	William H. Taliaferro	F. C. Bishopp

Secretary-Treasurer

1925–1929	William W. Cort
1930–1932	Norman R. Stoll

Secretary

1933–	Horace W. Stunkard

Treasurer

1933–	Justin Andrews

Council Members at Large

Paul Bartsch	1925–1928	W. H. Taliaferro	1928–1931
F. C. Bishopp	1925–1930	Asa C. Chandler	1929–1930
Robert Hegner	1925–1927	W. H. Herms	1930–1933
Charles A. Kofoid	1925	Benjamin Schwartz	1930–1933
B. H. Ransom*	1925	L. R. Cleveland	1931
William A. Riley	1925–26; 1928–30	W. W. Cort	1931–
Charles W. Stiles	1925; 1929–32	H. E. Ewing	1931–1932
E. E. Tyzzer	1925–1926	Ernest Carroll Faust	1931
Maurice C. Hall	1926–1929	John F. Kessel	1932–
W. G. Smillie	1926–1927	D. H. Wenrich	1932–
Henry B. Ward	1926–1929	H. E. Meleney	1933
Franklin D. Barker	1927–1930	Norman R. Stoll	1933
J. H. St. John	1927–1928		

* Deceased.

LIST OF MEETING PLACES

1925	Kansas City	1930	Cleveland
1926	Philadelphia	1931	New Orleans
1927	Nashville	1932	Atlantic City
1928	New York	1933	Boston
1929	Des Moines		

IN MEMORIAM

Francis Metcalf Root (1889–1934)

The sudden death of Dr. F. M. Root at the age of 45 on October 21 from a heart condition came as a great shock to all who knew him. While he had been ill for about a month it was only during the last week before his death that the seriousness of his condition was realized.

Dr. Root had served on the Editorial Committee of the Journal of Parasitology since its reorganization and had a very important part in developing the policies of the Journal during that critical period. His sound judgment and broad experience in editorial work will make his loss keenly felt by the Editorial Committee.

Dr. Root was a product of the Middle West having lived in Oberlin, Ohio, during most of the period of his education. He was graduated from Oberlin College in 1911 and received the Master's degree from the same institution in 1912. He later continued his graduate training in the field of zoology under the direction of Dr. H. S. Jennings and received the Ph.D. degree at the Johns Hopkins University in 1917. In 1919 he organized the work in medical entomology in the Johns Hopkins University School of Hygiene and Public Health and continued in charge of this department up to the time of his death.

His main research interest was in the taxonomy of the mosquitoes of the Western Hemisphere and his extensive work in this field had made him a world authority. He had a wide experience in the American tropics, having carried on investigations in Central America, the West Indies, Venezuela, and Brazil. Dr. Root was an outstanding teacher both in the direction of graduate students and in the organization of class work. His lectures were models of clearness and accuracy. Everything he did whether in research, teaching, or in editorial work bore the stamp of a superior mind.

Although somewhat quiet and reserved Dr. Root's keen sense of humor, his wide reading and broad experience made him one of the most interesting of companions. He was liked and admired by his students and associates and will be keenly missed by his many personal and scientific friends. His accomplishments were already important and his promise for the future was great. His untimely death at the very height of his power is a great loss to the field of Medical Entomology in which he was one of the outstanding American workers. A more adequate account of his life and work will appear in a later number of this journal.

Bailey Kelly Ashford (1873–1934)

The death of Dr. Bailey K. Ashford in San Juan, Puerto Rico, on November 1, 1934, removed an important figure from American parasitology and tropical medicine. Dr. Ashford's career was many sided. He was outstanding as a medical officer of the U. S. army, as a practitioner, a teacher, and a research worker. He devoted his life to the betterment of the people of Puerto Rico, to whom he was a friend, a constant helper, and a national hero. In the world of science he is best known as the discoverer of hookworm disease in Puerto Rico and as the first to plan and carry through a large scale program for hookworm control in a tropical country. His contributions to the development of our knowledge of the epidemiology and control of hookworm disease place him among the great pioneers in tropical medicine.

Dr. Ashford was born in Washington, D. C., on September 18, 1873. He received his M.D. degree from the Georgetown University Medical School in 1896 and after serving as a resident in the Children's Hospital in Washington in 1895-1896 was appointed a first lieutenant in the Medical Corps of the U. S. Army on November 6, 1897. The following year he graduated from the Army Medical School in Washington. In the summer of 1898 he went to Puerto Rico with the Expeditionary Force and took part in the battle of Hormigueros on August 13, 1898.

The turning point in his career came in 1899 when as an officer in charge of relief work in the interior of Puerto Rico he discovered that the anemia of the rural population was in reality hookworm disease. This discovery led to the establishment in 1904 of the Puerto Ricar Anemia Commission of which Dr. Ashford was the director. This commission treated over 300,000 people for hookworm disease and carried its program of control to all parts of the island. During his work with the Anemia Commission Dr. Ashford and his associates carried on extensive researches on all phases of the hookworm problem. These were gathered together in 1911 into a comprehensive report on "Uncinariasis in Puerto Rico" which is one of the landmarks in the development of our knowledge of hookworm disease and its control.

As a medical officer Dr. Ashford's promotion was rapid, reaching the grade of colonel in 1917. He served with distinction in the Great War, being division surgeon of the First Division of the American Expeditionary Force from June to October, 1917. He was then placed in charge of the battle training of medical officers in the Zone of Armies where he served until the Armistice. He received battle clasps for his service in the Aisne-Marne and Argonne-Meuse engagements. For his war services he also received the Distinguished Service medal and was made a Companion of the Order of St. Michael and St. George.

Dr. Ashford has also been active as a teacher of tropical medicine and as a practitioner. Since the organization of the School of Tropical Medicine in Puerto Rico he served on its staff as Professor of Tropical Medicine. For years in San Juan, Puerto Rico, he engaged in an extensive practice of medicine serving particularly the poorest elements of the population. During his last illness he still continued his medical practice even after he had to be carried by attendants to the bedsides of his patients. In addition to his extensive researches on hookworm disease Dr. Ashford carried on studies on other tropical diseases especially sprue on which he was a world authority.

Into a life that was all too short he crowded an astonishing number of conspicuous achievements. The keynote of his whole career was service to humanity. He was the most charming of companions and was admired and loved by his many friends and associates. His years of service to the people of Puerto Rico were fully appreciated by all classes, and when a few years ago the Distinguished Service medal was publicly awarded to him in San Juan he received a tremendous ovation. In his passing is lost one of the truly great men in American medicine and science, whose life and achievements stand as an inspiration to all of us. We are fortunate that he leaves to us under the title "A Soldier of Science" his autobiography which gives an intimate account of his life and work and in which the character and ideals of the man himself are revealed. In a later number of this journal will be published a more extensive account of Dr. Ashford's life and work.

AMERICAN SOCIETY OF PARASITOLOGISTS

LIST OF MEMBERS

Honorary Foreign Members

BAYLIS, HARRY A., B.A., M.A., D.Sc. (Oxford), Assistant Keeper in Department of Zoölogy, British Museum (Natural History), Cromwell Road, London, S.W. 7.

BRUMPT, ÉMILE, M.D., D.Sc. (Paris), Professor of Parasitology, Laboratoire de Parasitologie, Faculté de Médecine, 15, Rue de l'Ecole de Médecine, Paris VI.

FUHRMAN, OTTO, D.Sc. (Basel), Professor of Zoölogy Institut de Zoologie Université Neuchatel, Neuchatel, Switzerland.

FUJINAMI, AKIRA, Professor of Pathology, Faculty de Medecine, Kyoto Imperial University, Kyoto, Japan.

†FÜLLEBORN, FRIEDRICH, G. H. H., M.D., Director of the Institut für Schiffs-und Tropenkrankheiten, Hamburg, Germany.

MARTINI, ERIC, Ph.D. (Rostock), M.D., Professor of Medical Entomology, Institut für Schiffs-und Tropenkrankheiten, Hamburg, Germany.

NUTTALL, GEORGE H. F., M.D. (Cal), M.A., Ph.D. (Göttingen), Professor of Biology, University of Cambridge, England; Director, Molteno Institute for Research in Parasitology, The University, Cambridge.

PERRONCITO, EDOARDO, Professor Emeritus University of Torino, Italy.

SERGENT, EDMOND, M.D. (Paris), Director Institute Pasteur d'Algerie, Algerie, North Africa.

SERGENT, ETIENNE, M.D. (Montpellier), Chef de service a l'Institut Pasteur d'Algerie, Algerie, North Africa.

SKRJABIN, KONSTANTIN I., Professor, Director Institut d'helminthologie de l'Ecole Veterinaire, University of Moscow, Russia.

THEILER, ARNOLD (Sir), M.D., D.Sc., Ph.D., Bureau of Animal Health, Veterinary Laboratory, Weybridge, Surrey, England.

Active Members

Life members indicated by an asterisk

ACKERT, JAMES E., A.B., A.M., Ph.D. (Illinois), Professor of Zoölogy, Parasitologist Agr. Exp. Station; Dean Division of Graduate Study, Kansas State College, Manhattan, Kan.

AFRICA, CANDIDO M., M.D. (Univ. Philippines), D.T.M. & H. (London), Assistant Professor of Parasitology and Tropical Medicine, University of the Philippines, Manila, P. I.

ALICATA, JOSEPH E., B.A. (Grand Island College), M.A. (Northwestern), Bureau Animal Industry, U. S. Department of Agriculture, Washington, D. C.

ALLEN, ENA A., A.B. (Texas), A.M., Ph.D. (California), Bureau Animal Industry, U. S. Department of Agriculture, Washington, D. C.

ALLISON, LEONARD N., B.S. (Grove City College), M.A. (Buffalo), Science Teacher Lackawana, N.Y. Continuation School; 63 E. Main St., Lancaster, N. Y.

ALVEY, CLIFFORD H., B.S. (Huron), M.S., Ph.D. (New York), Instructor in Biology, Purdue University, School of Science, Biology Department, West Lafayette, Indiana.

AMEEL, DONALD J., A.B. (Detroit), M.A., Sc.D. (Michigan), Professor of Biology, Augustana College, Sioux Falls, S. D.

ANDERSON, MARLOWE G., A.B. (Nebr. Wesleyan), M.A., Ph.D. (Northwestern), Instructor in Zoölogy, Northwestern University, Evanston, Ill.

---

† Deceased, September 9, 1933.

ANDREWS, JUSTIN M., Ph.B. (Brown), Sc.D. (Johns Hopkins), Associate Professor of Protozoölogy, Johns Hopkins School of Hygiene and Public Health, 615 N. Wolfe St., Baltimore, Md.

ANDREWS, JOHN S., B.S., M.S. (Purdue), Bureau Animal Industry, U. S. Department of Agriculture, 1729 Q St., N. W., Washington, D. C.

ANNEREAUX, RALPH F., P. O. Box 85, Del Paso Heights, Sacremento, Calif.

†ASHFORD, BAILEY K., M.D. (Georgetown), Professor of Tropical Medicine and Mycology, Box 887, San Juan, Porto Rico.

ATCHLEY, FLOYD O., S.B. (Mount Union College), Sc.D. (Johns Hopkins), Department of Protozoölogy, Johns Hopkins University, 615 N. Wolfe St., Baltimore, Md.

AUGUSTINE, DONALD L., A.B. (Macalester College), Sc.D. (Johns Hopkins), Assistant Professor of Helminthology, Harvard Medical School, Boston, Mass.

BACHMAN, GEORGE W., B.S. (Heidelberg), M.A. (Columbia), Ph.D. (Chicago), Professor of Parasitology, Director of the School of Tropical Medicine, University of Porto Rico, San Juan, P. R.

BAKER, DONALD W., B.S. (Rutgers), D.V.M., Ph.D. (Cornell), Assistant Professor in Research in Animal Disease Parasitology, Cornell University, Ithaca, N. Y.

BALFOUR, MARSHALL C., B.S. (Mass. Inst. Tech.), M.D. (Harvard), 20 Rue de la Baume, Paris 8, France (49 East 49th St., New York City).

BALL, GORDON H., B.S., M.S. (Pittsburgh), Ph.D. (California), Assistant Professor of Zoölogy, University of California, Los Angeles, Calif.

BANGHAM, RALPH V., A.B. (Wilmington), B.S., M.A. (Haverford), Ph.D. (Ohio State), Professor of Biology, College of Wooster, Wooster, Ohio.

BARBER, LANAS S., B.S. (Kentucky State), M.A. (Cornell), Professor of Zoölogy and Head of Department, Fla. State College for Women, Tallahassee, Fla. 536 West College Ave., Tallahassee, Fla.

BARLOW, CLAUDE H., M.D. (Northwestern), Sc.D. (Hopkins), Public Health Lab., Cairo, Egypt.

BARRET, HARVEY P., A.B. (Centre College), M.D. (Louisville), P. O. Box 43, 612 Professional Bldg., Charlotte, N. C.

BARTSCH, PAUL, B.S., M.S., Ph.D. (Iowa), Curator, Division of Mollusks, U. S. National Museum; Professor of Zoölogy, The George Washington University, Washington, D. C.

BASS, CHARLES C., M.D. (Tulane), Sc.D. (Cincinnati), Dean and Professor of Experimental Medicine, Tulane University of Louisiana School of Medicine, New Orleans, La.

BEAUDETTE, FRED R., D.V.M. (Kansas State), Poultry Pathologist, New Jersey Agri. Exp. Station, New Brunswick, N. J.

BECKER, ELERY R., A.B. (Colorado), D.Sc. (Johns Hopkins), Associate Professor of Zoölogy, Iowa State College, Ames, Iowa.

BEERS, CHARLES D., A.B., A.M. (North Carolina), Ph.D. (Johns Hopkins), Associate Professor of Zoölogy, University of North Carolina, Box 289, Chapel Hill, N. C.

BENARROCH, ELIAS I., Dr. Med. Sciences (University of Caracas), Professor Morbid Anatomy, University of Caracas, Plaza Espana 33-3, Caracas, Venezuela, S. A.

BENBROOK, EDWARD A., V.M.D. (Pennsylvania), Professor and Head, Department of Veterinary Pathology, Iowa State College, Ames, Iowa.

BENNETT, HARRY J., B.S. (Louisiana State University), M.S. (Illinois), Instructor in Zoölogy, Box 376, Louisiana State University Station, Baton Rouge, La.

---

† Deceased, November 1, 1934.

BEQUAERT, JOSEPH C., Ph.D. (Ghent), Assistant Professor of Entomology, Department of Tropical Medicine, Harvard University Medical School, Boston, Mass.

BIFOSS, (REV.) CALLISTUS G., A.M. (West State College of Colorado), Professor of Biology and Head of Department, Quincy College, Quincy, Ill.

BIGELOW, ROBERT P., S.B. (Harvard), Ph.D. (Johns Hopkins), Professor Emeritus of Zoölogy and Parasitology, Mass. Inst. of Technology, Cambridge, Mass.

BISHOPP, FRED C., B.S., M.S. (Colorado Agri. College), Ph.D. (Ohio State University), Bureau of Entomology, U. S. Department Agriculture, Washington, D. C.

BLACK, JAMES J., D.V.M. (Kansas State Agri. College), Associate Poultry Pathologist, Poultry Laboratory, Landis & Brewster, Vineland, N. J.

BOARDMAN, EDWARD T., B.S., M.S. (University of Florida), Sc.D. (Johns Hopkins), Curator of Aquatic Biology, Cranbrook Institute of Science, Bloomfield Hills, Mich.

BOUGHTON, DONALD C., B.S. (Pittsburgh), M.S. (Minnesota), Ph.D. (Wisconsin), Rockefeller Institute, Princeton, N. J.

BOYD, GEORGE H., A.B., M.S. (Emory University), Sc.D. (Johns Hopkins), Professor of Zoölogy, University of Georgia, Athens, Ga.

BOYD, MARK F., M.D., M.S. (Iowa), C.P.H. (Harvard), Director, Station for Malaria Research, P. O. Box 793, Tallahassee, Fla.

BRADBURY, ORA C., B.S. (Ottawa), A.M., Ph.D. (Nebraska), Professor of Biology, Wake Forest College, Wake Forest, N. C.

BRANCH, HAZEL E., B.A., M.A. (Kansas), Ph.D. (Cornell), Professor of Zoölogy and Head of Department, University of Wichita, Wichita, Kansas.

BRANNON, CLARENCE H., B.S. (Mississippi State), M.S. (N. C. State), Extension Entomologist, North Carolina State College, University of North Carolina, Raleigh, N. C.

BROOKS, FRANK G., B.S. (Allegheny College), A.M. (Oklahoma), Sc.D. (Hopkins), Professor of Biology, Oklahoma City University, Oklahoma City, Okla.

BROWN, HAROLD W., A.B. (Kalamazoo College), M.S. (Kansas State Agri. College), Sc.D. (Johns Hopkins), M.D. (Vanderbilt), Research Associate in Pharmacology, Vanderbilt University Medical School, Nashville, Tenn.

BROWN, PHILIP W., B.A. (Colorado), M.D. (Pennsylvania), M.S. (Minnesota), Mayo Clinic, Rochester, Minn.

BROWNE, PATRICK, Technician, Rockefeller Institute, Princeton, N. J.

BRUES, CHARLES T., B.S., M.S. (Texas), Associate Professor of Entomology, Harvard University, Cambridge, Mass.

BUTLER, CAPT. CHARLES S., B.A. (Emory and Henry College), M.D. (Virginia), LL.D. (Emory and Henry College), Commanding Officer, U. S. Naval Hospital, 263 Flushing Ave., Brooklyn, N. Y.

CABLE, RAYMOND M., A.B. (Berea), Sc.M., Ph.D. (New York), Associate Professor of Biology and Biological Chemistry, Box 482, Berea College, Berea, Ky.

CAHN, ALVIN R., B.S. (Cornell), M.S. (Wisconsin), Ph.D. (Illinois), Assistant Professor of Zoölogy, University of Illinois, Vivarium Bldg., Champaign, Ill.

CAIN, CHARLES B., B.S. (Mississippi State), D.V.M., New York State Vet. College, (Cornell), M.S. (Iowa State), Animal Pathologist, Mississippi Agri. Exp. Station, State College, Miss.

CAMERON, ALNE E., V.S., Ontario Vet. College, (Toronto), Chief Veterinary Inspector, 231 Sunnyside, Ave., Ottawa, Ont.

CAMERON, THOMAS W. M., M.A., B.Sc., D.Sc. (Edinburgh), Ph.D. N R C V S (London), Research Professor of Parasitology and Director Institute of Parasitology, McGill, Montreal, Canada.

CANAVAN, WILLIAM P., A.B. (Lehigh), Ph.D. (Pennsylvania), Associate Professor of Bacteriology, University of Oklahoma School of Medicine, Oklahoma City, Okla.

CANNING, GRAEME A., B.S. (Northwestern), M.A. (Columbia), Ph.D. (Chicago), Associate Professor of Zoölogy and Parasitology, University of Tennessee, Knoxville, Tenn.

CARROLL, MATTHEW E., JR., A.B., A.M. (Kansas), Instructor in Zoölogy, Lincoln High School, Kansas City, Mo., 2811 Vine St., Kansas City, Missouri.

CARROLL, MITCHEL, B.S., Ph.D. (Pennsylvania), Professor of Biology and Chairman of the Department of Biology, Franklin and Marshall College, Lancaster, Pa.

CARTER, THOMAS C., A.M. (Colorado), Ph.D. (Wisconsin), Professor and Head of Biology Department, Northwestern State Teachers College, Alva, Okla.

CAUSEY, OTIS R., Premedical School, Chulalongkorn University, Bangkok, Siam.

CAUTHEN, GEORGE E., B.A. (Austin College), M.S. (Kansas State), Head of Science Department, Shenandoah College, Dayton, Virginia.

CHANDLER, ASA C., A.B. (Cornell), M.S., Ph.D. (California), Professor of Biology, Rice Institute, Houston, Texas.

CHANDLER, WALLACE L., B.S., M.S. (California), Ph.D. (Cornell), 626 Abbott Road, East Lansing, Mich.

CHEN, TZE-TUAN, B.A. (Fukien Christian University, Foochow, China), M.A. (Oberlin), Ph.D. (Pennsylvania), Osborn Zoölogical Lab., Yale University, New Haven, Conn.

CHITWOOD, BENJAMIN G., B.A. (Rice Institute), M.S., Ph.D. (George Washington), Bureau Animal Industry, U. S. Department Agriculture, Washington, D. C.

CHOW, HAN-FAN, Fan Memorial Institute of Biology, Peiping, China.

CHRISTENSON, REED O., B.S. (Utah State), M.A., Ph.D. (Minnesota), Department of Zoölogy, University of Minnesota, Minneapolis, Minn.

CHRISTIE, JESSE R., B.S. (Kentucky), M.S. (Illinois), Associate Nematologist, Bureau Plant Industry, U. S. Department Agriculture, Washington, D .C.

CHU, TSO-CHIH, B.A. (Lingnan University, Canton, China), M.S. (Yenching University, Peiping, China), Nat. Med. College of Shanghai, Shanghai, China.

CLARK, HEBRERT C., M.D. (Pennsylvania), Director, Gorgas Memorial Laboratory, Box 5025, Ancon, C. Z.

CLEVELAND, LEMUEL R., B.S. (Mississippi), D.Sc. (Johns Hopkins), Assistant Professor of Protozoölogy, Harvard Medical School, Boston, Mass.

COATNEY, G. ROBERT, B.A. (Grand Island College), M.A. (Nebraska), Ph.D. (Iowa State), Associate Professor of Biology, Peru State Teachers College, Peru, Neb.

COLE, DORIS, B.S., M.S. (Northwestern), 511 Second St., Waukegan, Ill.

COLLINS, RALPH K., B.S. (Kansas State), M.D. (Johns Hopkins), Rockefeller Foundation, 49 West 49th St., New York City.

COLLINS, WILLIS W., B.S., M.S. (Oklahoma A & M College), 1321 S 9th St., Woodward, Okla.

CORDI, JOSEPH M., B.A., M.S. (Johns Hopkins), 1511 N. Broadway, Baltimore, Md.

CORIA, NICHOLAS, Technician, Rockefeller Institute, 14 Pelham St., Princeton, N. J.

CORT, WILLIAM W., A.B. (Colorado), A.M., Ph.D. (Illinois), Professor of Helminthology, Johns Hopkins University School of Hygiene and Public Health, 615 N. Wolfe St., Baltimore, Md.

COVENTRY, FRANCES A., A.B. (Goucher College), D.Sc. (Johns Hopkins), School Lane Hills, Lancaster, Pa.

CRAIG, COL. CHARLES F., M.D. Honorary M.A. (Yale), Professor of Tropical Medicine and Head of Department, School of Medicine, Tulane University, New Orleans, La.

CRAM, ELOISE B., B.S. (Chicago), M.S., Ph.D. (George Washington), Bureau Animal Industry, U. S. Department Agriculture, Washington, D. C.

CROSS, SAMUEL X., B.A. (State Teachers College, Wayne, Neb.), M.S., Ph.D. (Wisconsin), Bureau Animal Industry, Beltsville, Md.

CROUCH, HUBERT B., A.B. (Texas College), M.S. (Iowa State), 218 Lincoln Way, Ames, Iowa.

CURRAN, JEAN A., B.A. (Carleton), M.D. (Harvard), 122 Gates Ave., Brooklyn, N. Y.

CURTIS, WINTERTON C., A.B., A.M. (Williams), Ph.D. (Johns Hopkins), Professor of Zoölogy, University of Missouri, 210 W. Mount Ave., Columbia, Mo.

CUVILLIER, EUGENIA, B.S., M.A. (George Washington), Bureau Animal Industry, U. S. Department Agriculture, 4107 Harrison St., N. W., Washington, D. C.

DARDINSKI, VINCENT J., A.B., M.A. (Catholic University), M.D. (Georgetown), Associate Professor of Pathology and Parasitology, Georgetown Medical School, 920 H St., N. W., Washington, D. C.

DAVIS, HERBERT S., Ph.B. (Wesleyan), Ph.D. (Harvard), U. S. Bureau of Fisheries, Washington, D. C.

DE RIVAS, DÁMASO, B.S., M.S., Ph.D. (Pennsylvania), Professor of Parasitology, University of Pennsylvania Medical School, 1831 Chestnut St., Philadelphia, Pa.

DIAZ, JULIO GARCIA, B.S., B.A. (Puerto Rico), M.S. (Cornell), Dean of the College of Arts and Sciences, and Professor of Biology, University of Puerto Rico, Rio Piedras, P. R.

DICKERMAN, E. EUGENE, B.A. (Grand Island College), M.S. (Northwestern), Department of Zoölogy, Northwestern University, Evanston, Illinois.

DIKMANS, GERARD, B.S.A. (Tennessee), D.V.M. (Michigan State), M.S. (Minnesota), Ph.D. (Georgetown), Bureau Animal Industry, U. S. Department Agriculture, Washington, D. C.

DILLER, WILLIAM F., A.B. (Franklin & Marshall), Ph.D. (Pennsylvania), Instructor in Zoölogy, Dartmouth College, Hanover, N. H.

DOVE, WALTER E., B.Sc. (Mississippi A & M College), Sc.D. (Johns Hopkins), U. S. Bureau Entomology, Box 22, Savannah, Ga.

DRAKE, CARL J., B.S., B.Pd. (Baldwin-Wallace College), Ph.D. (Ohio State), Professor and Head of Department, Zoölogy and Entomology, Iowa State College, Ames, Iowa.

DUNN, LAWRENCE H., Ovid, Seneca Co., N. Y.

DUSHAM, EDWARD H., A.B. (Dartmouth), M.S. (Pennsylvania State), Ph.D. (Cornell), Professor and Head of Department, Zoölogy and Entomology, Pennsylvania State College, State College, Pa.

EARLE, WALTER C., S.B. (Chicago), M.D. (Rush Medical College), Box 221, San Juan, P. R.

ELLIS, JOHN M., A.B., M.S. (Emory), Ph.D. (California), Head of Department of Biology, Junior College of Augusta, Augusta, Georgia.

ENDERS, HOWARD E., B.S., M.S. (Lebanon Valley College), B.S. (Michigan), Ph.D. (Johns Hopkins), Dean School of Science, Head Department of Biology and Professor of Zoölogy, Purdue University, Lafayette, Ind.; 249 Littleton St., West Lafayette, Ind.

ESSEX, HIRAM E., M.S., Ph.D. (Illinois), Assistant Professor of Physiology, Graduate School University of Minnesota; Mayo Foundation Associate in the Division of Exp. Surgery and Pathology, Rochester, Minn.

EWING, HENRY E.; A.B., M.S. (Illinois), Ph.D. (Cornell), Entomologist, U. S. Nat. Museum, Washington, D. C.

FANTHAM, HAROLD B., D.Sc. (London University), M.A. (Cambridge), Professor of Zoölogy, McGill University, Montreal, Canada.

FAUST, ERNEST C., A.B. (Oberlin College), M.A., Ph.D. (Illinois), Professor of Parasitology, Department of Tropical Medicine, Tulane University of Louisiana, 1430 Tulane Ave., New Orleans, La.

FERRY, QUIRINO B., A.B. (Kansas), Zoölogy Department, University of Kansas, Lawrence, Kan.

FISH, FREDERICK F., B.S. (Cornell), Sc.D. (Johns Hopkins), Associate Pathologist, U. S. Bureau of Fisheries, U. S. Fisheries Lab., 2725 Montlake Blvd., Seattle, Wash.

Fisher, Anna B., A.B. (University of California, Berkeley), M.S. (Chicago), Assistant Professor of Biology, Northwestern State Teachers College, Alva, Okla.

Fletcher, Samuel V., Ph.B. (Brown), A.M. (Pennsylvania), 608 S. High St., Chester, Pa.

Florence, Laura, M.A., B.Sc. (University of Aberdeen, Scotland), M.A. (Leland Stanford), Ph.D. (Cornell), Associate Professor of Bacteriology, New York Homeopathic Medical College and Flower Hospital, 445 E. 65th St., New York City.

Foster, Aurel O., B.A., M.A. (Wesleyan), Sc.D. (Johns Hopkins), Gorgas Memorial Laboratory, Ancon, C. Z.

Freeborn, Stanley B., B.S., Ph.D. (Mass. Agri. College), Professor of Entomology, Entomologist in the Exp. Station, University of California, Davis, Calif.

Fróes, Heitor P., Doctor in Medicine and Surgery, (School of Medicine, Bahia, Brazil), Free Professor of Tropical Diseases in the School of Medicine; Vice-president of the Hospitals Medical Society, Bahia; Rua do Garcia –75, Bahia, Brazil.

Frost, Florence M., B.A. (Northwestern), M.A. (Wisconsin), 11½ Panoramic Way, Berkeley, Calif.

Frye, William W., B.S. (Iowa Wesleyan), M.S., Ph.D. (Iowa State), Research Assistant, Department Prev. Med. and Public Health, Vanderbilt University Medical School, Nashville, Tenn.

Gabaldon, Arnoldo, M.D. (Universidad Central de Venezuela), John Hopkins University, School of Hygiene and Public Health, 615 N. Wolfe St., Baltimore, Md.

Geiman, Quentin M., B.S. (Gettysburg College), M.S., Ph.D. (University of Pennsylvania), Department of Comparative Pathology, Harvard Medical School, 372 Longwood Ave., Boston Mass.

Gingrich, Wendell, B.A. (North Central College), Sc.D. (Johns Hopkins), Associate Professor of Bacteriology and Prev. Med., University of Texas Medical School, Galveston, Texas.

Giordano, Alfred S., B.Sc., M.D. (Syracuse), M.Sc. (Minnesota), Director of South Bend Medical Laboratory, 604 N. Main St., South Bend, Ind.

Glaser, Rudolf W., A. B. (Michigan), Sc.D. (Harvard), Rockefeller Institute, Princeton, N. J.

Gonzalez-Martinez, Isaac F., Licensed in Med. in Barcelona; Doctor in Med. and Surgery in Madrid (Spain), Chief Roentgenologist in Diaz Garcia Clinic, Box 753, San Juan, P. R.

Graham, George L., A.B. (Grand Island College), M.S. (Kansas State), Sc.D. (Johns Hopkins), Research Fellow, Rockefeller Institute for Medical Research, Princeton, N. J.

Graham, John Y., B.S., M.S. (Princeton), Ph.D. (Munich), Department of Biology, University, Ala.

Grill, John C., M.D. (Vienna), Associate Professor, Pathology and Bacteriology, School of Medicine, Marquette University, Milwaukee, Wis.

Guberlet, John E., A.B. (Bethany College), A.M., Ph.D. (Illinois), Professor of Zoölogy, University of Washington, Seattle, Wash.

Gursch, Otto F., B.A. (State University of Iowa), Zoölogy Department, University of Chicago, Chicago, Ill.

Hackett, Lewis W., A.B., M.D., Dr. P.H. (Harvard), Assistant Director, International Health Division, Rockefeller Foundation, 168 Corso Vittorio Emanuele, Roma 116, Italy.

Hall, Maurice C., S.B. (Colorado College), M.A. (Nebraska), Ph.D., D.V.M. (George Washington), D.Sc., Hon. (Colorado), Chief, Zoölogical Division, Bureau Animal Industry, U. S. Department Agriculture, Washington, D. C.

HALL, RICHARD P., A.B. (Henderson-Brown College), A.M., Ph.D. (California), Associate Professor of Biology, New York University, University Heights, N. Y.

HALLIDAY, CHARLES H., M.D. (College Physicians & Surgeons, Baltimore), 2411 N. Charles St., Baltimore, Md.

HANNUM, CLAIR A., B.S., M.S. (Washington), Assistant Professor of Zoölogy, University of Arizona, Box 4012 University Station, Tuscon, Arizona.

HANSON, HENRY, A.B., A.M. (South Dakota), M.D. (Hopkins), State Health Officer, Florida Board of Health, Jacksonville, Fla.

HANSON, KARL B., B.S. (Agri. University of Wisconsin), D.V.M. (Michigan State), U. S. Exper. Fur Farm, Route 3, U. S. Department Agriculture, Saratoga Springs, N. Y.

HARWOOD, PAUL D., B.S. (Cornell), M.A., Ph.D. (Rice Institute), Bureau Animal Industry, Beltsville, Md.

HATHAWAY, EDWARD S., A.B. (Cincinnati), A.M., Ph.D. (Wisconsin), Professor of Zoölogy, Tulane University, New Orlans, La.

HEADLEE, WILLIAM H., A.B. (Earlham College), M.S. (Illinois), Department of Tropical Medicine, Tulane University, New Orleans, La.

HEDRICK, LESLIE, A.B. (Illinois), Ph.D. (Michigan), Head of Biology Department, Whitworth College, Spokane, Wash.

HEGNER, ROBERT W., B.S., M.S. (Chicago), Ph.D. (Wisconsin), Professor of Protozoölogy, Johns Hopkins University, 615 N. Wolfe St., Baltimore, Md.

HERBER, ELMER C., A.B. (Ursinus College), M.A. (Pennsylvania), Instructor Dickinson College, 416 W. South St., Carlisle, Pa.

HERMS, WILLIAM B., B.S. (Baldwin-Wallace College), M.A. (Ohio State), Professor of Parasitology, Head Division of Entomology and Parasitology, University of California, Berkeley, Calif.

HERRICK, CHESTER A., Sc.D. (Johns Hopkins), Assistant Professor of Zoölogy and Vet. Sci., University of Wisconsin, Madison, Wis.

HERTIG, MARSHALL, B.S., Ph.D. (Minnesota), Assistant Professor Medical Entomology, Department of Comparative Pathology, Harvard Medical School, Boston, Mass.

HETHERINGTON, DUNCAN C., A.B. (Colorado College), A.M., Ph.D. (Illinois), M.D. (Johns Hopkins), Associate Professor of Anatomy, Duke Medical School, Durham, N. C.

HILL, HOWARD R., A.B. (Carroll College), M.S. (Illinois), (Zoölogist, Los Angeles Museum, Exposition Park, Los Angeles, Calif.

HILL, ROLLA B., B.S. (Whitman), M.D. (Pennsylvania), Ph.D. (Hopkins), 20 Rue de la Baume, Paris 8, France.

HINMAN, E. HAROLD, B.A. (Queen's University, Canada), M.S., Ph.D. (Cornell), Assistant Professor of Parasitology and Medical Entomology, Department of Tropical Medicine, Louisiana State University Medical Center, 1542 Tulane Ave., New Orleans, La.

HINSHAW, WILLIAM R., D.V.M. (Michigan State), M.S. (Kansas State), Associate Veterinarian, University of California Agric. Exper. Station, Box 117, Davis, Calif.

HIYEDA, KENTARO, M.D. (Manchuria Medical College) Igakuhakushi (Kyushu Imperial Univ.), Professor of Pathology and Parasitology, Department of Parasitology, Manchuria Medical College, Mukden, Manchoukuo.

HOBMAIER, MICHAEL, Dr. Med. Vet. (University Munich, Germany), Associate Professor of Comparative Pathology at the Hooper Foundation for Medical Research, University Berkeley, 1374 Arguello Blvd., San Francisco, Calif.

HOEPPLI, REINHARD J. C., M.D. (University of Kiel), Sc.D. (University of Hamburg), Professor of Parasitology, Peiping Union Medical College, Peiping, China.

HOFFMAN, GEORGE L., B.S. (Purdue), Ph.D. (University of Bern, Switzerland), Consulting Clinical Lab., 215 Jenkins Arcade, Pittsburgh, Pa.

Hoffman, William A., B.S. (Cornell), Sc.D. (Johns Hopkins), Assistant Professor of Parasitology, School of Tropical Medicine, San Juan, P. R.

Hogue, Mary J., A.B. (Goucher), Ph.D. (University of Würzburg), Instructor in Anatomy, University of Pennsylvania Medical School, Philadelphia, Pa.

Holl, Fred J., B.S. (Buffalo), M.S. (Wisconsin), Ph.D. (Duke), Assistant Professor of Zoölogy, University of Buffalo, N. Y.

Holmes, Francis O., S.B. (Mass. Inst. Tech.), Sc.D. (Johns Hopkins), Rockefeller Institute for Medical Research, Princeton, N. J.

Hooker, William A., B.S. (Mass. College and Boston), D.V.M. (George Washington), LL.B., LL.M., M.P.L. (National University), Office of Exper. Station, U. S. Department Agriculture, Washington, D. C.

Hopkins, Sewell H., B.S. (William and Mary), M.A., Ph.D. (Illinois), Professor of Biology, Danville Junior College, Danville, Ill.

Horsfall, Margery W., B.A. (Reed College), M.A., Ph.D. (Illinois), Research Associate, University of Illinois, 301 Natural History, Urbana, Ill.

Houghton, Henry S., B.Ph., Sc.D. (Ohio State), M.D. (Johns Hopkins), LL.D. (University Hongkon), Field Representative China Med. Board, In Care China Med. Board, Peiping, China.

Hoyt, Robert N., B.S., C.P.H. (Mass. Inst. Tech.), C.P.H. (Harvard), D.P.H. (Georgia), Western Reserve University, School of Medicine, 27924 Gilchrist Drive, Cleveland, Ohio.

Hsiung, T. S., M.S., Ph.D. (Iowa State), Professor of Biology, Nankai University, Tientsin, China.

Hudson, Charles B., B.S., M.S. (Kansas State Agric. College), Assistant Poultry Pathologist, New Jersey Agric. Exper. Station, New Brunswick, N. J.

Huff, Clay G., A.B. (Southwestern), Sc.D. (Johns Hopkins), Assistant Professor of Parasitology, University of Chicago, Ill.

Huff, George, B.C.S. (Drake), M.S. (Iowa), Department of Zoölogy, Drake University, Des Moines, Iowa.

Hughes, Richard C., B.A. (Oklahoma University), M.S., Ph.D. (Michigan), Assistant Professor of Zoölogy, Oklahoma Agricultural and Mechanical College, 511 W. 5th Ave., Stillwater, Okla.

Huizenga, Lee S., M.D. (New York Homeop. Med. College), C.P.H., Ph.D. (Yale), Jukao, Kiangsu, China.

Hull, J. B., B.S. (Mississippi Agricultural and Mechanical College), Bureau of Entomology, Box 213, Fort Pierce, Fla.

Hunninen, Arne V., B.A., M.A. (Wesleyan), Johns Hopkins University, 615 N. Wolfe St., Baltimore, Md.

Hunter, George W., III, B.S. (Knox), M.S., Ph.D. (Illinois), Assistant Professor of Biology, Wesleyan University, Middletown, Conn.

Hsu, Doris M., B.A. (Hwa Nan College, Foochow, China), M.A. (Michigan), Zoölogy Department, University of Michigan, Ann Arbor, Mich.

Jacobs, William F., M.D. (Buffalo), Associate Professor of Pathology, Attending Pathologist at Buffalo City Hospital, 408 Richmond Ave., Buffalo, N. Y.

Jacocks, W. P., M.D. (Pennsylvania), Ph.D. (Johns Hopkins), International Health Division of the Rockefeller Foundation, Torrington Square, Colombo, Ceylon.

Jahn, Theodore L., B.A. (Rice Institute), M.Sc., Ph.D. (New York University), Research Associate, Iowa State University, Iowa City, Iowa.

James, William M., M.D. (Virginia), Chief of Medical Clinic, Herrick Clinic Panama, Box 913, Panama, R. P.

Jelen, George D., D.V.M., Sc.M. (Ohio State), Junior Veterinarian, Bureau Animal Industry, U. S. Department of Agriculture, 846 Oak St., Columbus, Ohio.

Johnson, Francis B., M.D. (Medical College, State of S. Carolina), Professor of Clinical Pathology, Medical College of the State of South Carolina, Charleston, S. C.

JOHNSON, WALTER T., B.S. (Agr.), D.V.M. (Washington State), Professor Vet. Med. Oregon State Agric. College, Corvallis, Oregon.

JOHNSTONE, HERBERT G., A.B., M.A., Ph.D. (California), Hooper Foundation, San Francisco, Calif.

JONES, E. ELIZABETH, A.B. (Radcliffe), A.M. (Maine), Ph.D. (Radcliffe), Research Fellow, Department of Comparative Pathology, Harvard Medical School, Boston, Mass.

JONES, MYRNA F., A.B. (Doane), M.S. (Illinois), Ph.D. (George Washington), Bureau Animal Industry, U. S. Department of Agriculture, Washington, D. C.

JONES, ROY W., A.B. (Oklahoma City), M.S. (Kansas State Agric.), Associate Professor of Biology, Central State Teachers College, 216 E. 3rd St., Edmond, Okla.

KAMM, MINNE W. (MRS.), A. B. (Olivet College), M.S., Ph.D. (Illinois), 265 Lake Shore Road, Grosse Pointe Farms, Mich.

KELLEY, RUTH SHAW (MRS.), A.B., M.A. (Kansas), Ph.D. (Pittsburgh), Assistant Professor of Biology, Kent State College, 237 E. Main St., Kent. Ohio.

KERR, JOHN A., B.S., M.D. (Northwestern), Caixa Postal 49, Rio de Janeiro, Brazil.

KERR, KATHEL B., A.B. (Oberlin College), M.S. (Washington University), Johns Hopkins University, School of Hygiene and Public Health, Baltimore, Md.

KESSEL, JOHN F., B.A. (Greenville College), M.A., Ph.D. (California), Professor Bacteriology and Parasitology, University of Southern California, Los Angeles, Calif.

KHAW, OO-KEK, M.B., Ch.B. (Edinburgh), D.T.M. (Liverpool), D.P.H. (Cambridge), D.T.H. (Tropen Institut), Assistant Professor in Parasitology, Peiping Union Medical College, Peiping, China.

KIEFFER, JOHN E., M.S. (Johns Hopkins), Department of Immunology and Filterable Viruses, John Hopkins University, 615 N. Wolfe St., Baltimore, Md., 206 Huntington Ave., Buffalo, N. Y.

KING, WILLARD V., B.S. (Montana State College), Ph.D. (Tulane), Bureau Entomology, U. S. Department of Agriculture, Box 491, Orlando, Fla.

KINSLEY, ALBERT T., B.S., M.S. (Kansas State Agri.), D.V.S. (Kansas City Vet.), Manager Kinsley Laboratories, 1103 E. 47th St., Kansas City, Mo.

KIRBY, HAROLD, JR., B.S. (Emory), M.A., Ph.D. (California), Associate Professor of Zoölogy, University of California, Berkeley, Calif.

KIRBY-SMITH, J. LEE, M.D., Sc.D. (University of the South), Dermatologist, Greenleaf & Crosby Bldg., 204 Laura St., Jacksonville, Fla.

KLOTZ, OSKAR, M.B. (Toronto), M.D., C.M. (McGill), Professor of Pathology and Bacteriology, University of Toronto, Toronto, Canada.

KOFOID, CHARLES A., A.B., Sc.D. (Oberlin), A.M., Ph.D. (Harvard), D.Sc. (Wales), Professor of Zoölogy, University of California, Berkeley, Calif.

KRULL, WENDELL H., B.A. (Upper Iowa University), M.S. (State University of Iowa), Ph.D. (Michigan), Bureau Animal Industry, U. S. Department of Agriculture, Washington, D. C.

LAAKE, ERNEST W., B.S. (Texas A. & M. College), Ph.D. (Iowa State), Entomologist, U. S. Department Agriculture, Box 208, Dallas, Texas.

LAMBERT, ROBERT A., A.B., A.M. (Howard College), M.D. (Tulane University), Associate Director for the Medical Sciences, Rockefeller Foundation, 49 E. 49th St., New York City.

LAMSON, PAUL D., A.B., M.D. (Harvard), Professor of Pharmacology, Vanderbilt University School of Medicine, Nashville, Tenn.

LANGE, MATHILDE M., Ph.D. (Zürich, Switzerland), Professor of Zoölogy, Wheaton College, Norton, Mass.

LARSON, MARY E., A.B., A.M. (Kansas), Department of Zoölogy, University of Kansas, Lawrence, Kansas.

LA RUE, GEORGE R., B.S. (Doane), M.A. (Nebraska), Ph.D. (Illinois), Professor of Zoölogy, University of Michigan, Ann Arbor, Mich.

LEADINGHAM, ROY S., M. D. (Creighton University), 110 Medical Arts Bldg., Atlanta, Ga.

LE ROUX, PHILIPPUS L., Member of the Royal College of Veterinary Surgeons, B.S. (Edinburgh), Veterinary Research Station, Marabuka, Northern Rhodesia, So. Africa.

LEWIS, FRANKLIN J., A.B. (Nebraska), M.A. (Northwestern), 9422 Monroe Ave., Brookfield, Ill.

LINTON, EDWIN, A.B., A.M. (Washington & Jefferson College), Ph.D. (Yale), Zoölogy Department, University of Pennsylvania, Philadelphia, Pa.

LOESCH, JOHN, M.D. (German University Prague), J. N. Adams Mem. Hospital, Perrysburg, N. Y.

LOEWEN, SOLOMON L., A.B. (Tabor College), M.A. (Minnesota), Professor of Biology, Sterling College, Sterling, Kansas.

LUCAS, MIRIAM S. (MRS.), B.S., Ph.D., (Pennsylvania), Instructor in Cytology, Medical School, Washington University, St. Louis, Mo.

LUDLOW, ALFRED I., A.B. (Adelbert College, Western Reserve University), M.D. (Western Reserve University School of Medicine), M.S. (Western Reserve), D.Sc. (College of Wooster), Professor Surgery and Director Research Department, Severance Union Medical College, Seoul, Chosen (Korea).

LYNCH, JAMES E., A.B., A.M. (Nebraska), Ph.D. (California), Associate Professor of Fisheries, University of Washington, Seattle, Washington.

LYNCH, KENNETH M., M.D. (Texas), LL.D. (South Carolina), Professor of Pathology, Medical College of the State of South Carolina, Charleston, S. C.

LYON, MARCUS W., JR., Ph.B. (Brown), M.S., M.D., Ph.D. (George Washington), Pathologist South Bend Clinic, 214 Laporte Ave., South Bend, Ind.

MCCLURE, GERVASE W., B.A. (Carson-Newman), M.A. (Tennessee), New York Zoölogical Park, 185th St. and Southern Blvd., Bronx, New York.

MCCOY, OLIVER R., A.B., M.S. (Washington University), Sc.D. (Johns Hopkins), Assistant Professor of Parasitology, University of Rochester School of Medicine and Dentistry, Rochester, N. Y.

MCCULLOCH, IRENE A., A.B., A.M. (Kansas), Ph.D. (California), 821 W. 103rd Place, Los Angeles, Calif.

MCINTOSH, ALLEN, B.S. (Mississippi A. & M. College), M.S. (Minnesota), Assistant Zoölogist, Bureau Animal Industry, U. S. Department of Agriculture, Washington, D. C.

MCKINLEY, EARL B., A.B. ,M.D. (Michigan), Dean and professor of Bacteriology, George Washington University, School of Medicine, 14th and H Sts., N.W., Washington, D. C.

MCMULLEN, DONALD B., B.S. (Tarkio College), M.S. (Washington University), Johns Hopkins University School of Hygiene and Public Health, Baltimore, Md.

MCQUISTON, W. CARLTON, M.S. (Ohio State), Professor of Biology, American University, 113 Dazr al Aini, Cairo, Egypt.

MACKIN, JOHN G., B.S. (East Central College), M.S., Ph.D. (Illinois), Professor of Biology, East Central College, Ada, Okla.

MAGATH, THOMAS B., Ph.B (Emory College), M.Sc. (James Millikin University), Ph.D., M.D. (Illinois), Associate Professor of Pathology and Parasitology, University of Minnesota, Consulting Physician, Clinical Laboratories, Mayo Clinic, Rochester, Minn.

MANGET, F. P., Union Hospital, Huchow, Chekiang, China.

MANTER, HAROLD W., A.B. (Bates College), M.A., Ph.D. (Illinois), Associate Professor of Zoölogy, University of Nebraska, Lincoln, Nebr.

MANWELL, REGINALD D., A.B., A.M. (Amherst), Sc.D. (Johns Hopkins), Assistant Professor of Zoölogy, College of Liberal Arts, 206 Lyman Hall, Syracuse University, Syracuse, N. Y.

MARIN, RAFAEL A., S.B. (Harvard), M.D. (Columbia), City Hospital Welfare Island, N. Y.

MARK, EDWARD L., A.B. (Michigan), Ph.D. (Leipzig), LL.D. (Michigan), LL.D. (Wisconsin), Herrsey Professor of Anatomy (Emeritus) Harvard University, 109 Irving St., Cambridge, Mass.

MARTIN, HARRY M., D.V.M. (Pennsylvania), A.M., Ph.D. (Nebraska), Assoc. Professor, Pathology and Parasitology School Vet. Med., University of Pennsylvania, Philadelphia, Pa.

MARTIN, REX K., B.S., M.S. (Michigan), 3250 W. Chicago, Detroit, Michigan.

MATHESON, ROBERT, B.S., M.S., Ph.D. (Cornell), Professor of Entomology (Medical and Vet. Entomology & Parasitology), Cornell University, Ithaca, N. Y.

MATTHES, HOMER C., B.A., M.A. (Rice Institute), Rice Institute, Houston, Texas.

MEIER, ALBERT H., A.B. (Illinois), M.S. (Northwestern), Ph.D. (Ohio State), Superintendent North Shore Mosquito Abatement District, 2220 Sherman Ave., Evanston, Ill.

MELENEY, HENRY E., A.B. (Darmouth), M.D. (Columbia), Associate Professor of Preventive Medicine and Public Health, Vanderbilt University School of Medicine, Nashville, Tennessee.

MESERVE, FRANK G., A.B. (Nebraska), M.A. (Northwestern), University of Nebraska, Lincoln, Nebr.

MICKEY, ARTHUR B., A.B. (Nebraska), M.A. (Northwestern), Assistant Professor of Zoölogy, University of Wyoming, Laramie, Wyo.

MIDDLETON, AUSTIN R., A.B., Ph.D. (Johns Hopkins), 101 W. Chestnut St., Louisville, Ky.

MILLER, EDWIN L., B.S. (Iowa Wesleyan), M.S., Ph.D. (Illinois), Instructor of Zoölogy, Louisiana State University, Box 376, Baton Rouge, Louisiana.

MILLER, HARRY M., JR., B.S. (Ohio Wesleyan) Ph.D. (Illinois), Assistant Director, Rockefeller Foundation, 20 Rue de la Buame, Paris 8, France.

MOLLOY, DANIEL M., M.D. (Nashville), Dr.P.H. (Johns Hopkins), Field Director, International Health Division, The Rockefeller Foundation, Apartado VIII, Jan Jose, Costa Rica, Central America.

MÖNNIG, HERMANN O., B.A. (Hons.) (Cape), Ph.D. (Zürich), B.V.Sc. (S. Africa), Veterinary Research Officer, Onderstepoort, Professor of Parasitology, Faculty of Veterinary Science, University of Pretoria; Onderstepoort, Tvl., South Africa.

MOORE, J. PERCY, A.B. (Cent. High School, Phila.), B.S., Ph.D. (Pennsylvania), Professor of Zoölogy, Zoölogical Laboratory, University of Pennsylvania, Pa.

MORELAND, GEORGE E., A.B. (Greenville College), M.S. (Michigan), Professor of Biology, Greenville College, Greenville, Ill.

MORRIS, SAMUEL, B.S. (Pennsylvania State), M.A. (Pennsylvania), Biology Department, Temple University, Philadelphia, Pa.

MOULTON, MAJ. S. A., Fitzsimons Gen. Hospital, Denver, Col.

MUCKLÉ, CRAIG W., A.B. (Princeton), M.D. (Pennsylvania), Craig Hall, Haverford, Pa.

MUELLER, JUSTUS F., A.B. (Johns Hopkins), M.A., Ph.D. (Illinois), Assistant Professor of Zoölogy, New York State College of Forestry, Syracuse, N. Y.

MUGRAGE, EDWARD R., B.A., M.A. (Denver), M.D. (Colorado), Professor of Clinical Pathology, and Head of Department, University of Colorado School of Medicine, 4200 E. 9th Ave., Denver, Colo.

NELSON, E. CLIFFORD, A.B., M.A. (Colorado), Sc.D. (Johns Hopkins), Instructor in Zoölogy, University of Maine, Orono, Maine.

NELSON, THURLOW C., B.S. (Rutgers), Ph.D. (Wisconsin), Professor of Zoölogy, Rutgers University, New Brunswick, N. J.

NIGRELLI, ROSS F., B.S. (Pennsylvania State), M.S. (New York University), New York Aquarium, Battery Park, New York.

NOBLE, ALDEN E., B.A. (Ohio Wesleyan), M.S. (Ohio State), Ph.D. (California), Professor of Zoölogy, College of the Pacific, Stockton, Calif.

Nolan, Mabelle O. (Mrs.), B.A. (Smith), M.A. (American University), Junior Nematologist, National Institute of Health, 2540 Massachusetts Ave., N.W., Washington, D. C.

Noland, Lowell E., B.A. (DePauw), M.A., Ph.D. (Wisconsin), Associate Professor of Zoölogy, University of Wisconsin, 1723 Summit Ave., Madison, Wis.

Nolf, Luther O., B.S. M.S. (Kansas State), Sc.D. (Johns Hopkins), Associate Professor of Zoölogy, State University of Iowa, Iowa City, Ia.

O'Roke, Earl C., A.M., M.A. (Kansas), Ph.D (California), Assistant Professor of Forest Zoölogy, University of Michigan, School of Forestry and Conservation, Ann Arbor, Mich.

Osborn, Herbert, B.Sc., M.Sc., D.Sc. (Iowa State), LL.D. (Pittsburgh), Professor Emeritus in Zoölogy and Entomology, Ohio State University, Columbus, Ohio.

Osburn, Raymond C., B.Sc., M.Sc. (Ohio State), Ph.D. (Columbia), Chairman, Department of Zoölogy and Entomology, Ohio State University, Columbus, Ohio, and Director, Stone Biological Laboratory, Put-in Bay, Ohio.

Otto, Gilbert F., A.B. (Kalamazoo College), M.S. (Kansas State), Sc.D. (Johns Hopkins), Associate in Helminthology, Johns Hopkins University, School of Hygiene and Public Health, 615 N. Wolfe St., Baltimore, Md.

Owen, William B., B.A. (Kentucky), M.A. (Minnesota), Department of Zoölogy, University of Wyoming, Laramie, Wyoming.

Parker, Ralph R., B.Sc., M.Sc., Ph.D. (Massachusetts State), U. S. Public Health Service, in Charge of Rocky Mountain Spotted Fever Investigations, Hamilton, Mont.

Parman, Daniel C., B.S.A. (Tennessee), Associate Entomologist, Bureau of Entomology, U. S. Department Agriculture, Box 509, Uvalde, Texas.

Pavlinova, Yelena, Department Hygiene and Bacteriology, University of Chicago, Chicago, Illinois.

Pearse, Arthur S., B.S., M.A. (Nebraska), Ph.D. (Harvard), Professor of Zoölogy, Duke University, Durham, N. C.

Pemberton, Cyril E., A.B. (Stanford), Executive Entomologist, Experiment Station, Hawaiian Sugar Planters' Association, Honolulu, Hawaii.

Philip, Cornelius B., B.Sc. (Nebraska), M.S., Ph.D. (Minnesota), U. S. Public Health Service, Rocky Mountain Spotted Fever Laboratory, Hamilton, Montana.

Porter, Dale A., A.B. (Kalamazoo College), M.S. (Kansas State), Assistant in Helminthology, Johns Hopkins University, School of Hygiene and Public Health, Baltimore, Md.

Pote, Thomas B., D.V.Sc. (McGill), M.D. (Washington University), Lecturer Pathology, Medical Department, Washington University, 4925 Park View Place, St. Louis, Mo.

Powers, Philip B. A., A.B. (Kansas), M.A. (Rice Institute), Zoölogy Department, University of Pennsylvania, 38th St. & Woodland Ave., Philadelphia, Pa.

Price, Emmett W., D.V.M. (George Washington University), M.S. (American University), Parasitologist, Bureau Animal Industry, U. S. Department Agriculture, Washington, D. C.

Price, Helen F., A.B. (Central College), M.A. (Missouri), Ph.D. (Michigan), Zoölogy Department, University of Michigan, Ann Arbor, Mich.

Raffensperger, Hayes B., Ped.M. (Teachers College), M.D.C. (Chicago Vet.), In charge Zoölogy Laboratory, Moultrie, Ga., P. O. Drawer 231, Moultrie, Ga.

Ratcliffe, Herbert L., B.Sc. (Emory), D.Sc. (Johns Hopkins), Associate in Pathology, University of Pennsylvania and Assistant Pathologist, Zoölogical Society of Philadelphia, Philadelphia, Pa.

Reardon, Lucy, B.A., M.A. (George Washington University), National Institute of Health, 805 Prince St., Alexandria, Va.

REBRASSIER, RUSSELL E., D.V.M., M.Sc. (Ohio State), Associate Professor of Veterinary Parasitology, Ohio State University, Columbus, Ohio.

REES, CHARLES W., B.S. (Utah), M.A., Ph.D. (California), Associate Zoölogist, Bureau Animal Industry, U. S. Department Agriculture, Washington, D. C.

REYNOLDS, BRUCE D., B.S. (Virginia), Sc.D. (Hopkins), Associate Professor of Biology, University of Virginia, University, Va.

RICHARDSON, FLAVIA L., A.B., M.A. (Maine), University of Vermont, Burlington, Vt.

RIETZ, JOHN H., D.V.M., M.Sc. (Ohio State), Associate Professor Vet. Medicine, Oglebay Hall, West Virginia University, Morgantown, W. Va.

RIFENBURGH, SUMNER A., B.S., A.B., A.M. (Valparaiso University), S.M. (Chicago), Zoölogy Department, Purdue University, 246 Marstellar St., West Lafayette, Ind.

RILEY, WILLIAM A., B.S. (DePauw), Ph.D. (Cornell), Sc.D. (DePauw), Professor of Zoölogy, Chief Division Entomology and Economic Zoölogy, University of Minnesota, University Farm, St. Paul, Minn.

ROBERTS, RAIFORD A., B.S. (Texas A. & M. College), M.S. (Iowa State), Assistant Entomologist, U. S. Bureau of Entomology, Box 509, Uvalde, Texas.

RODRIQUEZ-MOLINA, RAFAEL, B.S. (University of Puerto Rico), M.D. (Medical College of Virginia), Associate in Medical Zoölogy, School of Tropical Medicine, San Juan, P. R.

†ROOT, FRANCIS M., A.B., A.M. (Oberlin), Ph.D. (Johns Hopkins), Associate Professor of Medical Entomology, Johns Hopkins University School of Hygiene & Public Health, 615 N. Wolfe St., Baltimore, Md.

ROUDABUSH, ROBERT L., B.A. (Lebanon Valley College), M.S. (Iowa State), Zoölogy Department, Iowa State College, Ames, Iowa.

RUSSELL, COL. FREDERICK F., M.D. (Columbia), D.Sc. (George Washington), International Health Division, Rockefeller Foundation, 49 E. 49th St., New York City.

RUSSELL, PAUL F., A.B. (Boston University), M.D. (Cornell), M.P.H. (Harvard), Rockefeller Foundation, Calcutta, India.

ST. JOHN, MAJOR JOE H., M.D. (Vanderbilt), Director Dep't Protozoölogy, Army Medical School, Washington, D. C.

SANDGROUND, JACK H., B.Sc., M.Sc. (University of South Africa), D.Sc. (Johns Hopkins), Assistant Professor Harvard Medical School, Curator of Helminthology, Museum of Comparative Zoölogy, Harvard University, Boston, Mass.

SARLES, MERRITT P., B.S. (Wesleyan), Sc.D. (Johns Hopkins), Department of Hygiene and Bacteriology, University of Chicago, Chicago, Ill.

SATTERTHWAIT, ALFRED F., Associate Entomologist, U. S. Entomological Laboratory, 527 Ivanhoe Place, Webster Groves, Mo.

SAUNDERS, LESLIE G., B.S.A., M.Sc. (McGill), Ph.D. (Cambridge), University of Saskatchewan, Saskatoon, Canada.

SAWYER, WILBUR A., A.B., M.D. (Harvard), Associate Director of International Health Division, Rockefeller Foundation, 49 West 49th St., New York; 29 Ferndale Drive, Hastings-on-Hudson, New York.

SCHELL, MARGARET W., A.B., M.A., Ph.D. (California), Assistant Professor of Zoölogy, University of Utah, Salt Lake City, Utah.

SCHOONHOVEN, JOHN J., M.A., D.Sc. (St. Francis College), Instructor in Education, New York University, 773 Eastern Parkway, Brooklyn, N. Y.

SCHOR, IRVING M., B.S. (New York University), M.S. (Virginia), Medical College of Virginia, Richmond, Va., 469 Palisades Ave., West New York, N. J.

SCHWARTZ, BENJAMIN, A.B. (College of City of New York), A.M. (Columbia), Ph.D. (George Washington), Assistant Chief, Zoological Division, Bureau Animal Industry, U. S. Department of Agriculture, Washington, D. C.

---

† Deceased, October 21, 1934.

Scott, James A., B.A., M.A. (Wesleyan), D.Sc. (Johns Hopkins), International Health Division, Rockefeller Foundation, Public Health Laboratories, Cairo, Egypt.

Scott, Joseph M., B.S. (Mt. Union College), Sc.D. (Hopkins), 1415 Inwood Road, Alliance, Ohio.

Scott, John W., A.B., A.M. (Missouri), Ph.D. (Chicago), Professor of Zoölogy and Research Parasitologist, University of Wyoming, Laramie, Wyo.

Scudder, C. F., 199 Main St., Northport, Long Island, N. Y.

Semans, Frank M., B.A., M.A. (Ohio State), 108 Mill St., New Lepington, Ohio.

Shattuck, George C., A.B., M.D., A.M. (Harvard), Assistant Professor of Tropical Medicine, Harvard Medical School, Boston, Mass.

Shaw, James N., B.S. (Agri. Oregon State), C.V.M., B.S. (Vet. Med. Washington State), Assistant Professor Vet. Med., Oregon State College, Corvallis, Oregon.

Sherman, Grace W., B.A. (Wisconsin), Office of Nematology, Bureau Plant Industry, U. S. Department of Agriculture, Washington, D. C.

Shields, Randolph T., A.B. (Washington & Lee), M.D. (Virginia Medical College), Professor of Histology and Embryology; Dean School of Medicine, Cheeloo University, Tsinan, Shantung, China.

Simms, Bennett T., D.V.M. (Alabama Polytechnic Institute), Professor Veterinary Medicine, Oregon State Agricultural College, Corvallis, Oregon.

Sinitsin, Dimitry F., Doctor of Zoölogy (St. Petersburg), 219 So. Grand Ave., Los Angeles, Calif.

Skidmore, Louis V., B.S. (Agr. University of Missouri), D.V.M. (Kansas State Agr.), Associate Professor, Department Animal Pathology & Hygiene, University of Nebraska, Lincoln, Nebraska.

Smith, Septima C., A.B., A.M. (Texas), Sc.D. (Johns Hopkins), Associate Professor of Zoölogy, University of Alabama, University, Alabama.

*Smith, Theobald, Ph.B. (Cornell), M.D. (Albany Medical College), Hon. A.M., Sc.D. (Harvard), LL.D. (Chicago, Washington, St. Louis, Princeton, Yale, Pennsylvania), Hon. M.D. (Breslau), Hon. Sc.D. (Rutgers), Hon. Dr. (Royal Hungarian Vet. Acad.), Hon. D.V.M. (Giessen), Director Emeritus, Rockefeller Institute, Princeton, N. J.

Sommermeyer, Viola, Bachelor degree (Minnesota), Owner and Director of Clinical Laboratory, 301 Medico-Dental Bldg., San Diego, Calif.

Soper, Fred L., A.B., M.S. (Kansas), M.D. (Rush), Dr. P. H. (Hopkins), International Health Division, Rockefeller Foundation, Caixa Postal 49, Rio de Janeiro, Brazil.

Spindler, Lloyd A., B.S., M.S. (Kansas), Sc.D. (Johns Hopkins), Assistant Zoölogist, Bureau Animal Industry, U. S. Department of Agriculture, Washington, D. C.

Stabler, Robert M., Sc.D. (Johns Hopkins), Instructor in Zoölogy, University of Pennsylvania, Philadelphia, Pa.

Stafford, Ethelbert W., B.S.A. (Toronto), M.S. (Mississippi), Associate Professor of Zoölogy and Entomology, Mississippi State College, State College, Miss.

Stauber, Leslie A., B.S., M.Sc., (Rutgers), 5524 Ellis Ave., Chicago, Ill.

Steiner, Gotthold, Ph.D. (Bern), Division of Nematology, Bureau Plant Industry, U. S. Department of Agriculture, Washington, D. C.

Stevenson, Lionel, B.S.A. (Toronto), M.S. (Illinois), B.V.Sc. (Toronto), Ontario Veterinary College, Guelph, Ontario, Canada.

Stewart, Morris A., B.S., (New Hampshire), M.S., Ph.D. (Cornell), Instructor of Biology, The Rice Institute, Houston, Texas.

Stiles, Charles W., A.M., Ph.D. (Leipzig), M.D. (Paris), Hon. M.S., D.Sc. (Wesleyan), LL.D. (North Carolina), Hon. M.D. (Richmond), Hon. D.Sc. (Yale), Room 302, U. S. Nat. Mus., Washington, D. C.

STOLL, NORMAN R., B.S. (Mount Union), M.S. (Michigan), Sc.D. (Johns Hopkins), Associate Member Department Animal and Plant Pathology, Rockefeller Institute for Medical Research, Princeton, N. J.

STRONG, RICHARD P., Ph.B. (Yale), M.D. (Johns Hopkins), Hon. Sc.D. (Yale), Hon. Sc.D. (Harvard), Professor of Tropical Medicine, Harvard University Medical School, Boston, Mass.

STUNKARD, HORACE W., B.S. (Coe), A.M., Ph.D. (Illinois), Professor of Biology, New York University, University Heights, New York.

SVENSSON, RUTH M., M.D. (Royal University of Upsala, Sweden), Hospitalet, Västervik, Visby, Sweden.

SWEET, WINFIELD C., B.S. (Colgate), M.D. (Rush), Dr. P. H. (Hopkins), International Health Division, Rockefeller Foundation, The Madras Club, Madras, Madras Presidency, India.

SWEZEY, WILLIAM W., S.B. (Mount Union College), Sc.D. (Johns Hopkins), York College, York, Neb.

TALBOT, S. BENTON, D.Sc. (Johns Hopkins), Professor of Biology, Davis-Elkins College, Elkins, W. Va.

TALIAFERRO, WILLIAM H., B.S. (Virginia), Ph.D. (Johns Hopkins), Professor of Parasitology, Chairman of Department of Hygiene & Bacteriology; Associate Dean, Division of Biological Sciences, University of Chicago, Chicago, Illinois.

TASKER, ROY C., A.B. (Hillsdale College), A.M. (Michigan), Instructor in Zoölogy, Cornell University, Ithaca, N. Y.

TENBROECK, CARL, A.B. (Illinois), M.D. (Harvard), Rockefeller Institute, Princeton, N. J.

THEILER, HANS, M.S. (Cornell), Department of Comparative Pathology, Harvard Medical School, Boston, Mass.

THOMAS, LYELL J., B.S. (Fargo), M.S., Ph.D. (Illinois), Assistant Professor of Zoölogy, University of Illinois, Urbana, Ill.

THORNE, GERALD, B.S. (Utah State), M.S. (University of Utah), Associate Nematologist, U. S. Department of Agriculture, 477 Federal Bldg., Salt Lake City, Utah.

TIDD, WILBUR M., A.B., M.S. (Ohio State), Zoölogy Department, Ohio State University, Columbus, Ohio.

TOWNSEND, ELSIE W., A.B., M.A. (Michigan), Biology Department, Wayne University, Detroit, Mich.

TRAVIS, BERNARD V., B.S. (Colo. Agr.), M.S. (Iowa State), Research Assistant, Agr. Exp. Station, Iowa State College, Zoölogy Department, Ames, Iowa.

TROISI, RAPHAEL A., A. B. (Temple), M.A., Ph.D. (Pennsylvania), Instructor in Zoölogy, Temple University, 1212 Dickinson St., Philadelphia, Pa.

TSUCHIYA, HIROMU, Sc.D. (Johns Hopkins), Department of Bacteriology and Public Health, Washington University School of Medicine, St. Louis, Mo.

TURNER, JOHN P., B.S., M.S. (Emory), Ph.D. (California), Instructor in Zoölogy, University of Minnesota, Minneapolis, Minn.

TYZZER, ERNEST E., Ph.B., A.M. (Brown), M.D. (Harvard), Professor of Comparative Pathology, Harvard Medical School, Boston, Mass.

UNDERWOOD, PAUL C., B.V.Sc. (Toronto), V.S. (Ontario Vet. College), Jr. Veterinarian, Bureau Animal Industry, U. S. Department of Agriculture, Washington, D. C.

VAN CLEAVE, HARLEY J., B.S. (Knox College), M.S., Ph.D. (Illinois), Professor of Zoölogy, University of Illinois, Urbana, Illinois.

VAN VOLKENBERG, HORATIO L., B.S., D.V.M., M.S. (Cornell), U. S. Department Agriculture, Porto Rico Agric. Exper. Station, Box 98, Mayaguez, P. R.

VERGEER, TEUNIS, A.B. (Calvin College), M.Sc., Ph.D. (Michigan), Professor of Biology, Hope College, 88 East 9th St., Holland, Mich.

VISSCHER, J. PAUL, A.B. (Hope College), A.M., Ph.D. (Johns Hopkins), Professor of Biology, Western Reserve University, Cleveland, Ohio.

Vogel, Hans, Ph.D., M.D., Tropeninstitut, Bernard Nochstr, 74 Hamburg 4, Germany.

Walker, Joseph H., Jr., B.S. (Georgia), M.S. (Illinois), Assistant Professor of Zoölogy, University of Alabama, University, Ala.

Wallace, Franklin G., B.S. (Carleton College), M.A. (Minnesota), Department of Biology, Lingnan University, Canton, China.

Walton, Arthur C., B.A., M.A. (Northwestern), Ph.D. (Illinois), Chairman, Department of Biology, Knox College, Galesburg, Ill.

*Ward, Henry B., A.B., Sc.D. (Williams), A.M., Ph.D. (Harvard), Sc.D. (Cincinnati), LL.D. (Oregon), Permanent Secretary, American Association for the Advancement of Science, Urbana, Ill.

Ward, James W., B.A. (Alabama), M.S. (Mississippi State), M.A. (Alabama), Instructor in Zoölogy, Mississippi State College, State College, Mississippi.

Warren, Andrew J., M.D. (Tulane), C.P.H. (Johns Hopkins), International Health Division, Rockefeller Foundation, 49 E. 49th St., New York City.

Warren, Herbert S., B.S. (College of the City of New York), M.A. (Columbia), Ph.D. (Leland Stanford Jr.), Assistant Professor of Biology, Temple University, Broad and Montgomery Sts., Philadelphia, Pa.

Wehr, Everett E., B.S.A. (Idaho), M.S. (California), Assistant Zoölogist, Bureau Animal Industry, U. S. Department of Agriculture, Washington, D. C.

Weidman, Fred D., M.D. (Pennsylvania), Professor of Dermatological Research, Associate Pathologist, University of Pennsylvania, Philadelphia, Pa.

Wenrich, David H., A.B., A.M. (Kansas), Ph.D. (Harvard), Professor of Zoölogy, University of Pennsylvania, Philadelphia, Pa.

Wetzel, Rudolf, D.M.V., Zoologisches Institut, Tierärztliche Hochschule, Hannover, Germany.

White, Gershom F., B.S. (Ohio), Ph.D. (Cornell), M.D. (George Washington), Senior Pathologist, U. S. Bureau of Entomology, 1322 Vermont Ave., N. W., Washington, D. C.

Whitmore, Eugene R., B.S. (Wisconsin), M.D. (Illinois), Dr.P.H. (Johns Hopkins), Ph.D. (Georgetown), Professor Parasitology and Pathology, Georgetown University Medical & Dental Schools; Pathologist Georgetown University Hospital; Head, Department of Pathology and Radiology, Gallinger Municipal Hospital, 2139 Wyoming Ave., N. W., Washington, D. C.

Wichterman, Ralph, B.S. (Temple), M.A. (Pennsylvania), Biology Department, Temple University, Philadelphia, Pa.

Wieczorowski, Elsie I., B.S., M.S. (Northwestern), Senior Assistant, Zoölogy Department, Northwestern University, 932 Wolfram St., Chicago, Ill.

Will, Homer C., A.B. (Bridgewater College), A.M. (Virginia), Ph.D. (Pittsburgh), Department of Biology, Juniata College, Huntingdon, Pa.

Willey, Charles H., A.B., Sc.M., Ph.D. (New York), Assistant Professor of Biology, University College, New York University, University Heights, N. Y.

Williams, Owen L., A.B. (Nebraska), M.A., Ph.D. (California), Professor of Zoölogy, College of the Pacific, Stockton, Calif.

Wilson, Francis H., B.S., M.S., Ph.D. (Cornell), Assistant Professor of Zoölogy, Tulane University, New Orleans, La.

Wilson, Irl D., D.V.M., Ph.D. (Iowa State), M.S. (Pennsylvania State), Professor and Head, Department of Zoölogy and Animal Pathology, Virginia Polytechnic Institute; Animal Pathologist, Va. Agri. Exp. Station, Blacksburg, Va.

Wilson, John W., B.S. (Clemson College), M.S. (North Carolina State), M.S., Sc.D. (Harvard), R. F. D. # 2, Silver Lake, Leesburg, Fla.

Woke, Paul A., Sc.B. (Ottawa University), Johns Hopkins University School of Hygiene and Public Health, 808 N. Patterson Park Ave., Baltimore, Md.

Woodbury, Lowell A., B.S., M.S. (Utah), U. S. Bureau of Fisheries, 248 University St., Salt Lake City, Utah.

Woodhead, Arthur E., A.B. (Clark), A.M., Ph.D. (Michigan), Assistant Professor of Zoölogy, University of Michigan, Ann Arbor, Mich.

Wright, Willard H., D.V.M. (George Washington), M.S. (American University), Associate Veterinarian, Bureau Animal Industry, U. S. Department of Agriculture, Washington, D. C. .

Wu, Lien-Teh, M.A., M.D. (Cambridge), C.P.H. (Johns Hopkins), Director, National Quarantine Service Headquarters, 2 Peking Rd., Shanghai, China.

Wu, Kuang, Ph.D. (Michigan), Department of Parasitology, National Health Administration, Nanking, China.

Yeatter, Ralph E., B.S. (Michigan State), M.S., Ph.D. (Michigan), Game Specialist, Illinois State Natural History Survey, Urbana, Illinois.

Yokogawa, S., The Department of Experimental Pathology and Parasitology, Government Medical College, Taihoku, Formosa, Japan.

Young, Benjamin P., B.S. (Kansas), Ph.D. (Cornell), Assistant Professor of Zoölogy, Cornell University, Ithaca, N. Y.

Zetek, James, B.A. (Illinois), Entomologist, U. S. Department Agriculture, Drawer Z, Balboa, Canal Zone.

INDEX TO VOLUME XX

Acanthatrium molossides n. sp., from the bat 335
Acanthocephala, status of certain genera of 324
Ackert, J. E. and L. L. Eisenbrandt, Resistance of bronze turkeys and white leghorn chickens to *Ascaridia lineata* 129
Ackert, J. E., L. L. Eisenbrandt, B. Glading, and J. H. Wilmoth, Resistance of six breeds of chickens to *Ascaridia lineata* 127
Ackert, J. E. and J. H. Wilmoth, Resistant and susceptible strains of white minorca chickens to *Ascaridia lineata* 323
Alaria canis n. sp., in dogs in northern Ontario 335
Alicata, J. E., Development of *Hyostrongylus rubidus* 97
Alicata, Joseph E., Development of *Oesophagostomum dentatum* in guinea-pig and rabbit 73
Alicata, Joseph E., Parasites of 150 students in District of Columbia 338
Alicata, J. E., Sex differentiation in preparasitic larvae of *Hyostrongylus rubidus* 127
Alicata, Joseph E. (see Schwartz and Alicata) 326
Alicata, Joseph E. and Allen McIntosh, *Ascarops strongylina,* correct name for *Arduenna strongylina* and *Ascarops minuta* 62
Allassostoma parvum, notes on 109
Allen, E. A., Occurrence of *Eimeria truncata* in the United States 73
Allen, E. A., Pathogenicity of *Eimeria mitis* to three-month-old chickens 73
Allen, E. A., *Spirochaeta lagopodis* in blood of willow grouse 97
Alvey, C. H., Life cycle of *Sphyranura oligorchis* 140
Alvey, C. H., *Sphyranura oligorchis* n. sp. from *Necturus maculosus* 140
Alvey, C. H. and K. E. Kintner, *Taenia asiota* n. sp. from screech owl 327
Alvey, C. H. and W. E. Martin, Lymph system of *Sphyranura oligorchis* 327
Amebic infection, experimental in reptiles 328
American Society of Parasitologists:
Abstracts for ninth annual meeting 121
Abstracts for tenth annual meeting 323
Announcements 60
Announcements 317
List of former officers 148
List of former officers 341
List of members 345
Officers for 1933 147
Officers for 1934 340
Program of ninth annual meeting 115
Program of tenth annual meeting 319
Report of ninth annual meeting 255
Amidostomum spatulatum, in United States 68
Amoeba, parasitic in *Zelleriella* 122
Amoebiasis, in reptiles 139
Ancylostoma caninum, blood studies with 142
Ancylostoma caninum, development following percutaneous infection 326
Ancylostoma caninum, primary monobrom hydrocarbons for 114
Anderson, Marlowe G., Validity of *Taenia confusa* 207
Andrews, John S., Development of pre-parasitic larval stages of *Ostertagia circumcincta* 63
Andrews, J. S. (see Dikmans and Andrews) 107
Andrews, Justin, Chemical treatment of litter in control of rabbit coccidiosis 100

Andrews, Justin, Control of poultry coccidiosis by chemical treatment of litter ... 99
Andrews, Justin, Diagnosis of intestinal protozoa from purged and normally passed stools ... 253
Andrews, Justin, Effect of oily mixtures of phenolics on the oöcysts of poultry coccidia ... 124
Andrews, Justin, *Endamoeba histolytica* and other protozoa in Baltimore rats 334
Andrews, Justin, Resistance and susceptibility in coccidial infections ... 332
Anopheles pseudopunctipennis, abnormal parabasal spines in male hypopygium of ... 315
Anthelmintics, comparative toxicity of ... 141
Arnett, J. H. (see Wenrich, Stabler and Arnett) ... 141
Arnold, John G., Jr., Some trematodes of the common bullhead ... 136
Ashford, Bailey K. (Obituary) ... 343
Ascaridia lineata, resistant and susceptible strains of white minorca chickens to ... 323
Ascaridia lineata, resistance of bronze turkeys and white leghorn chickens to ... 129
Ascaridia lineata, resistance of six breeds of chickens to ... 127
Ascarids, effect of N-Butylidene Chloride on colts infested with ... 77
Ascaris eggs, when infective ... 126
Ascaris infection, resistance of cat to ... 126
Ascaris lumbricoides, anomalous ... 314
Ascaris, post-treatment reinfection with, in the United States ... 245
Ascarops strongylina, correct name for *Arduenna strongylina* and *Ascarops minuta* ... 62
Ascocotyle plana, what is it ... 110
Atchley, Floyd, Cultivation of *Balantidium* in fecal extracts ... 144
Atchley, Floyd O. (see Boughton, Atchley, and Eskridge) ... 123
Atchley, F. O. (see Swezey and Atchley) ... 313

Bachman, George W., R. Rodríquez-Molina, and J. Oliver-González, *Trichinella spiralis* antigen in other disease conditions ... 146
Balantidium coli, quantitative studies in rat with ... 331
Balantidium, cultivation and cross-infection experiments with ... 329
Balantidium, cultivation in fecal extracts ... 144
Balantidium, starch-charcoal mixture in cultivation of ... 144
Ball, Gordon H., Gregarine parasitic in striped shore crab ... 122
Becker, Elery R., Check-list of the coccidia of the genus *Isospora* ... 195
Becker, Elery, R., Nature of immunity in coccidiosis ... 332
Becker, E. R. and R. D. Burroughs, Rediscovery of *Eimeria carinii* ... 123
Bequaert, J., Molluscan intermediate host of *Schistosoma japonicum* in the Philippines ... 280
Bishopp, F. C., A destructive outbreak of the screw worm in the Southwest. 337
Bladder fluke, frog, life history of ... 134
Blanfordia, note on the genus ... 282
Blood picture, of children in Louisiana ... 142
Boughton, Donald C., Periodicity in the oocyst-production of the pigeon *Eimeria* ... 329
Boughton, Donald C., Floyd O. Atchley and Lydia C. Eskridge, Extension of intervals between oöcyst-peaks in sparrow Coccidium ... 123
Boyd, George H., Effect of quinine upon reproduction of *Plasmodium cathemerium* ... 139
Brachylaemus spinosulum, opossum a new host for ... 98
Brachylaemus sp., life history of ... 109
Brannon, C. H., Blow fly, *Lucilia sericata* ... 190
Breder, C. M., Jr. (see Nigrelli and Breder) ... 136

Breder, Charles M., Jr. (see Nigrelli and Breder) 259
Brown, Harold W. (see Harwood and Brown) 128
Brown, H. W. and P. D. Lamson, Comparative toxicity of certain anthelmintics 141
Buhrer, Edna M., Host plants of the root-knot nematode, *Heterodera marioni* 102
Burroughs, R. D. (see Becker and Burroughs) 123

Caconema radicola, effects of crude ammonia thiocyanate upon larvae of ... 64
Canavan, Wm. P. N., A six-suckered tapeworm, *Taenia hydatigenea* 57
Capillaria, species in birds 334
Cassidy, Gertrude H., *Mononchus cobbi* as a variety of *Mononchus parvus* . 102
Cercaria sphaerula n. sp., infecting cyclops 285
Cercariaeum nephroplexus n. sp., from *Helix albolabris* 335
Cercorchis medius, life cycle of 248
Cestode, poultry 66
Chandler, Asa C., Passive transfer of immunity to an intestinal nematode infection 333
Chandler, E. R., *Unionicola aculeata* in snails in North Carolina 312
Chitwood, B. G., Changes in genus for fish nematodes formerly placed in *Filaria* 104
Chitwood, B. G., Nematode from *Lynx canadensis* 63
Chitwood, B. G., Revised classification of the Nematoda 131
Chitwood, B. G., Status of *Spirocerca sanguinolenta* 69
Chitwood, B. G., Systematic position of *Echinonema grayi* 104
Chitwood, B. G. and B. M. Chitwood, Characters of a protonematode 130
Chitwood, M. B. (see Chitwood and Chitwood) 130
Christie, J. R., Some saprophytes or semi-parasitic nematodes infesting plants. 63
Christie, J. R., and Louise Crossman, Dissemination of a diplogasterid 69
Clinostomum marginatum, life cycle of 325
Clinostomum marginatum, miracidium of 132
Clinostomum, notes on 108
Coatney, G. Robert, Atabrine and plasmochin in *Haemoproteus* infection of pigeon 145
Coatney, G. Robert (see Prouty and Coatney) 139
Cobb, Margaret V., N. A. Cobb: New nemic genera and species 81
Coccidia, bovine carriers 126
Coccidia, rabbit, cross infection experiments on chicks with 277
Coccidia, incidence in common English sparrow 331
Coccidia, of man 144
Coccidia, of martins and sables 251
Coccidia, physiological effects on chickens 123
Coccidia, poultry, effect of oily mixtures of phenolics on the oöcysts of 124
Coccidial infections, resistance and susceptibility in 332
Coccidiosis, chronic avian 330
Coccidiosis, control of, in poultry by chemical treatment of litter 99
Coccidiosis, histopathology of caecal type in chicken 330
Coccidiosis, nature of immunity in 332
Coccidiosis, rabbit, chemical treatment of litter in control of 100
Coccidiosis, treatment with powdered buttermilk 230
Coccidium, sparrow, extension of intervals between oöcyst-peaks of 123
Cochliomyia, a destructive outbreak of 337
Cooper, Corinne, Effect of derris extract and rotenone upon *Tylenchus dipsaci* 74
Cooper, Corinne, Effect of some arsenic compounds on some plant parasitic nemas 70

Cooper, Corinne, Effects of crude ammonia thiocyanate upon the larvae of *Caconema radicola* ... 64
Corder, Margaret N., Length of dormancy in certain plant nematodes ... 104
Coria, N. A. (see Glaser and Coria) ... 33
Cort, W. W. (see Nolf and Cort) ... 38
Cort, W. W. (see Otto and Cort) ... 245
Courtney, W. D., New host of *Tylenchus dipsaci* from Oregon ... 65
Cotylophoron cotylophoron, life history studies on ... 173
Cotylurus flabelliformis, immunity of snails to penetration of cercariae of ... 38
Cram, Eloise B., *Eustrongylides ignotus* from black-crowned night heron ... 71
Cram, Eloise B., *Habronema incerta* in a new bird host and new locality ... 74
Cram, Eloise B., Life history of *Seurocynrea colini* ... 98
Cram, Eloise B., Life history of *Tetrameres pattersoni* ... 97
Cram, Eloise B., Species of *Capillaria* parasitic in birds ... 334
Cram, Eloise B. and Eugenia Cuvillier, *Trichostrongylus tenuis* in domestic and game birds in United States ... 128
Crassiphiala ambloplites, life history of ... 328
Crepidostomum brevivitellum n. sp. ... 295
Crooks, Kenneth B. M., Cross infection experiments on chicks with coccidia from rabbit ... 277
Cross, S. X., Host parasite relationships of fish parasites ... 132
Cross, S. X., Iron conservation and utilization by dogs with hookworm anemia ... 337
Cross, Samuel X., Non-specific immunity between parasites of ciscoes ... 244
Crossman, Louise, Life history and morphology of *Tylocephalus bacillivorus* n. g., n. sp. ... 106
Crossman, Louise (see Christie and Crossman) ... 69
Cryptocotyle lingua, resistance of terns to ... 135
Cushing, E. C. (see Dove and Cushing) ... 138
Cuvillier, Eugenia (see Cram and Cuvillier) ... 128
Cylindrogaster longistoma, relationship ... 66
Cysticercus pisiformis, immunity in rabbits against ... 328

Dacnitoides, status of ... 76
Davis, Nelson Caryl (Obituary) ... 95
Dematobia hominis, prevalence and importance in Panama ... 219
Dicrocoelium lasiuri, from liver of red bat ... 137
Dikmans, G., *Antilocarpa americana* as host of *Nematodirella longispiculata* ... 107
Dikmans, G., Localization of *Ostertagia* in host ... 65
Dikmans, G. and J. S. Andrews, Time of survival of larvae of certain nematodes on pastures ... 107
Dikmans, G. and J. S. Andrews, Life history of *Ostertagia circumcincta* ... 107
Diphyllobothrium, from cats ... 140
Diphyllobothrium latum, ova in Esquimo mummy from Greenland ... 133
Diplogasterid, on the dissemination of ... 69
Diplostomulum, of *Triturus viridescens* ... 132
Distome, metacercaria in brown rat ... 250
Dirofilaria immitis, in Virginia dog ... 77
Dirofilaria immitis, in Virginia dogs ... 112
Dirofilaria immitis, periodicity of larvae in dogs ... 113
D'Oelsnitz, M., Diagnostic et Traitement du Kala-azar Mediterraneen (Review) ... 59
Dove, W. E. and E. C. Cushing, Migrations of warbles in reindeer ... 138
Dove, W. E. and E. C. Cushing, Warble injuries to reindeer hides ... 138
Dove, W. E. and D. G. Hall, Control of sand flies and salt marsh mosquitoes 337
Dove, W. E. (see Hull, Dove and Prince) ... 162
Dunihue, F. W. (see Stunkard and Dunihue) ... 137

Dunn, Lawrence H., *Gigantorhynchus echinodiscus* in the anteater of Panama ... 227
Dunn, Lawrence H., Prevalence and importance of tropical warble fly in Panama ... 210
Dunn, Lawrence H., Ticks from tapirs of Panama ... 312

Eaton, Paul, *Piroplasma canis* in Florida ... 312
Echinonema grayi, systematic position of ... 104
Echinura spinosa, male of *Tetrameres* ... 113
Echinurioides, is it a good genus ... 78
Egg counts, plotted on a logarithmic scale ... 145
Eimeria carinii, rediscovery of ... 123
Eimeria mitis, pathogenicity of ... 73
Eimeria mustelae, n. sp., from *Mustela vison* ... 252
Eimeria, pigeon, periodicity and oocyst-production of ... 330
Eimeria tenella, development of resistance by chicken to ... 320
Eimeria truncata, occurrence in United States ... 73
Eisenbrandt, L. L. (see Ackert and Eisenbrandt) ... 129
Eisenbrandt, L. L. (see Ackert, Eisenbrandt, Glading, and Wilmoth) ... 127
Endamoeba histolytica, and other protozoa in Baltimore rats ... 334
Endamoeba histolytica, attempts to produce infection in young pigs with human strain ... 133
Endamoeba histolytica, cultivation of ... 143
Endamoeba histolytica, effect of culture filtrates on pathogenicity of ... 330
Endamoeba histolytica, properties of dyes upon ... 143
Endamoeba histolytica, starch diet and infections with, in chicks ... 57
Endamoeba histolytica, transmission in drinking water ... 100
Entosiphonus thompsoni, a new host for ... 98
Epibdella melleni, susceptibility and immunity of certain marine fish to ... 136
Epibdella melleni, susceptibility and immunity of marine fish to ... 250
Eskridge, Lydia, C. (see Boughton, Atchley and Eskridge) ... 123
Eustomos chelydrae, life history of ... 326
Eustrongylides ignotus, from black-crowned night heron ... 71
Ewing, H. E., New pit-producing mite from South American snake ... 53
Ewing, Harry E., *Neocolpocephalum* new name for Mallophagan genus *Ferrisia* ... 65

Fallis, A. M. (see La Rue and Fallis) ... 335
Fasciola hepatica, infections of white footed mouse with ... 99
Fasciola hepatica, new snail and rabbit hosts for ... 49
Fasciola magna, new snail hosts for ... 107
Faust, Ernest C., Filarial infection in marmosets in Panama ... 324
Faust, Ernest Carroll, Interrelations of parasite and host-tissue in experimental *Strongyloides* infection ... 333
Faust, Ernest Carroll and William A. Hoffman, Molluscan phase of the life cycle of *Schistosoma mansoni* ... 131
Filarial infection, in marmosets in Panama ... 324
Fish parasites, host parasite relationships of ... 132
Flagellates, of termites, morphology of ... 121
Flagellates, in termites, distribution of ... 121
Foster, A. O., Blood studies with the dog hookworm ... 142
Fülleborn, Friedrich (Obituary) ... 95
Fülleborn, Friedrich (Photograph) ... 202
Fülleborn, Friedrich, life and work ... 203
Freeborn, Stanley B., Economic importance, life history, and control of *Moniezia expansa* ... 131

Frye, William W. and Henry E. Meleney, Effect of various culture filtrates on the pathogenicity of *E. histolytica* for kittens 336
Frye, William W. and Henry E. Meleney, Intestinal protozoa of young pigs and attempts to produce infection with *Endamoeba histolytica* 133

Gabaldon, Arnoldo, Quantitative studies with *Balantidium coli* in the rat .. 331
Gafford, James A., Jr., (see Kessell and Gafford) 330
Gasterophilus intestinalis, first-stage larvae in tongues of horses 196
Gasterostomes, spermatogenesis in 336
Geiman, Quentin M. (see Ratcliffe and Geiman) 139
Geiman, Quentin M. (see Ratcliffe and Geiman) 328
Gieson, John, Apparent case of a pathogenic rotifer in man 133
Giesen, John and J. L. Worden, Wanderings of *Icosiella quadrituberculata* in the bull frog 130
Gigantorhynchus echinodiscus, in ant-eater of Panama 227
Gingrich, Wendell, Effect of an increased burden of phagocytosis upon immunity to bird malaria 332
Glading, B. (see Ackert, Eisenbrandt, Glading, and Wilmoth) 127
Glaser, R. W. and N. A. Coria, Culture of *Paramecium caudatum* free from living micro-organisms 33
Gouseff, W. F. (see Yakimoff and Gouseff) 251
Graham, George L., Reaction of laboratory rats to graded numbers of *Nippostrongylus* larvae 128
Graham, George L. and Dale A. Porter, Strains of *Nippostrongylus muris* in various strains of rats 323
Gregarine, parasitic in striped shore crab 122
Guberlet, John E., Ectoparasitic trematodes of Puget Sound fishes 324
Gyrodactylus, in tadpoles of *Rana catesbiana* 137

Harwood, Paul D., Anomalous *Ascaris lumbricoides* from swine 314
Harwood, Paul D., and Harold W. Brown, In vitro consumption of oxygen by parasitic nematodes 128
Habronema incerta, new bird host and new locality 74
Haematoloechus complexus, new hosts for 98
Haemoproteus, pigeon, effect of atabrine and plasmochin on 145
Halipegus occidualis, life history of 133
Halipegus occidualis, life cycle of 327
Hegner, Robert, Infections of vagina of Rhesus monkeys with *Trichomonas hominis* from man 247
Hegner, Robert, Passage of *Trichomonas hominis* through monkey 199
Hegner, Robert, Protozoa from intestines of chimpanzees 143
Hegner, Robert, Starch diets and infections with *Endamoeba histolytica* in chicks 57
Hegner, Robert, Transmission of *Endamoeba histolytica* in drinking water . 199
Helminthological Society of Washington 200
Helminthological Society of Washington, one hundred fifty-second meeting . 62
Helminthological Society of Washington, one hundred fifty-third meeting .. 69
Helminthological Society of Washington, one hundred fifty-fourth meeting . 73
Helminthological Society of Washington, one hundred fifty-fifth meeting .. 97
Helminthological Society of Washington, one hundred fifty-sixth meeting .. 99
Herrick, C. A., Development of resistance to *Eimeria tenella* by the chicken 329
Herrick, C. A., Physiological effects of coccidia on chickens 123
Heterodera marioni, host plants of 102
Heterophyidae, from fish 137
Himasthla quissentensis, life history of 336
Hinman, E. Harold, *Uranotaenia* spp. in Louisiana 339
Hoffman, William A. (see Faust and Hoffman) 131
Hogue, M. J., Four races of *Retortamonas* 331

Hookworm anemia, iron conservation and utilization by dogs with 337
Hookworm disease, epidemiology in Palestine 146
Hopkins, Sewell H., *Crepidostomum brevivitellum* n. sp. 295
Hoskins, Meredith, Attempt to transmit yellow fever virus by dogfleas and flies 299
Hull, J. B., W. E. Dove, and F. M. Prince, Seasonal incidence and concentrations of sand fly larvae in salt marshes 162
Hunninen, A. V. (see Hunter and Hunninen) 132
Hunter, George W., III and A. V. Hunninen, Plerocercoid larva of *Proteocephalus ambloplites* 132
Hunter, George W., III (see Hunter and Hunter) 132
Hunter, George W., III and Wanda S. Hunter, Life cycle of *Clinostomum marginatum* 325
Hunter, George W., III and Wanda S. Hunter, Life history of *Crassiphiala ambloplites* 328
Hunter, Wanda S. (see Hunter and Hunter) 325
Hunter, Wanda S. (see Hunter and Hunter) 328
Hunter, Wanda Sanborn and George W. Hunter, III, Miracidium of *Clinostomum marginatum* 132
Hyostrongylus rubidus, development of 97
Hyostrongylus rubidus, sex differentiation in preparasitic larvae of 127

Icosiella quadrituberculata, wanderings in the bull frog 130
Index, volume 20 363
Isospora, check list of 195
Ixodes ricinus californicus, parasitism of lizards by 243

Jahn, Theo. L., Oxidation-reduction potential in growth of intestinal parasites in vitro 129
Jellison, Wm. L., Parasitism of lizards by *Ixodes ricinus californicus* 243
Johnston, Arthur Dean (see Thomas and Johnson) 327
Johnson, W. T., Chronic avian coccidiosis 330
Jones, M. F., Notes on cestodes of poultry 66
Journal of Parasitology, announcement 59
Journal of Parasitology, changes 318

Kala-azar, diagnostic et traitement (Review) 59
Kelley, Ruth Shaw, Variations in *Plagitura salamandra* 324
Kerr, K. B., Immunity in rabbits against *Cysticercus pisiformis* 328
Kessel, John F., Attempt to transmit *Trichomonas vaginalis* to the intestinal tract of kittens 124
Kessel, John F., Two coccidia reported from man 144
Kessel, John F. and James A. Gafford, Jr., Trichomonas vaginitis 330
Kidney worm, swine, control of 129
Kingscote, A. A., *Eimeria mustelae,* n. sp. from *Mustela vison* 252
Kintner, K. E. (see Alvey and Kintner) 327
Kirby, Harold, Distribution of flagellates in termites 121
Kirby, Harold, Morphology of devescovinid flagellates of termites 121
Knipling, E. F., First-stage larvae of *Gasterophilus intestinalis* in tongues of horses 196
Krull, Wendell H., Infections of white-footed mouse with *Fasciola hepatica* 99
Krull, Wendell H., Life history of a frog bladder fluke 134
Krull, Wendell H., Life history of *Brachylaemus* sp. 109
Krull, Wendell H., Life history of *Eustomos chelydrae* 326
Krull, Wendell, H., Life history of *Halipegus occidualis* in *Rana clamitans* . 133
Krull, Wendell H., Life history studies on *Cotylophoron cotylophoron* 173
Krull, Wendell H., New hosts for *Haematoloechus complexus* 98

Krull, Wendell H., New snail and rabbit hosts for *Fasciola hepatica* 49
Krull, Wendell H., New snail hosts for *Fasciola magna* 107
Krull, Wendell H., New snail hosts for *Paramphistomum cervi* 108
Krull, Wendell H., Notes on *Allassostoma parvum* 109
Krull, Wendell H., Notes on *Clinostomum* 108
Krull, Wendell H., *Peromyscus leucops noveboracensis* a new host for *Entosiphonus thompsoni* 98
Krull, Wendell H., Opossum a new host for *Brachylaemus spinosulum* 98
Krull, Wendell H., Toxic effect of copper for snails 109

Lamson, P. D. (see Brown and Lamson) 141
LaRue, G. R., and A. M. Fallis, *Alaria canis* n. sp. in dogs in northern Ontario 335
Leucochloridium, reproduction in 336
Lipeurus heterographus, life cycle and bionomics of 304
Loewen, S. L., Distome metacercaria in brown rat 250
Lucilia sericata, observations on 190
Lyon, M. W., Jr., Conjunctival ophthalmomyiasis caused by *Oestrus ovis* .. 337

McCoy, O. R., Artificial immunization of rats against trichiniasis 142
McCoy, O. R., Development of adult trichinae in chick and rat embryos ... 333
McIntosh, Allen, *Dicrocoelium lasiuri* n. sp. from liver of red bat 137
McIntosh, Allen, Equine parasites from Puerto Rico 110
McIntosh, Allen, Polyandry and Polygamy in parasitic worms 141
McIntosh, Allen (see Alicata and McIntosh) 62
McMullen, Donald B., Life cycle of turtle trematode, *Cercorchis medius* ... 248
McMullen, Donald B., Life history of *Macroderoides typicus* 135
Macroderoides typicus, life history of 135
Magath, Thomas Byrd, Structure of *Trichomonas vaginalis* 121
Maggots, production for surgical use 338
Malaria, avian, number of species 334
Malarias, avian, effect of rauwolfine on 125
Malaria, bird, effect of increased burden of phagocytosis upon immunity to. 332
Malaria, bird, production by injection of sporozoites 198
Malarial infection, duration in birds 124
Manwell, Reginald D., Duration of malarial infection in birds 124
Manwell, Reginald D., Effect of rauwolfine on the avian malarias 125
Manwell, Reginald D., How many species of avian malaria are there 334
Martin, W. E., *Acanthatrium molossidis* n. sp. from the bat 335
Martin, W. E., *Cercariaeum nephroplexus* n. sp. from *Helix albolabris* 335
Martin, W. E. (see Alvey and Martin) 327
Mayhew, Roy L., Histopathology of caecal type of coccidiosis in chicken ... 330
Mayhew, Roy L., Treatment of coccidiosis with powdered buttermilk 230
Meggitt, F. J., Summary of 918 chordate dissections for parasites 76
Meggitt, F. J., Tapeworms from bull snake, with remarks on genus *Oochoristica* 181
Meleney, Henry E. (see Fry and Melency) 133
Meleney, Henry E. (see Fry and Meleney) 336
Meserve, F. G., New genus and species of parasitic turbellaria from Bermuda sea cucumber 270
Mite, new pit-producing from South American snake 53
Moniezia expansa, notes on 131
Mononchus cobbi, as variety of *Mononchus parvus* 102
Mosquitoes, salt marsh, control of 337
Mueller, Justus F., A *Diphyllobothrium* from cats 140
Mueller, Justus F., Heterophyidae from fish 137
Mueller, Justus F., Status of genus *Dacnitoides* 76

Naobranchia wilsoni, a new copepod from *Diodon hystrix* 138
Nelson, E. Clifford, Cultivation and cross-infection experiments with *Balantidium* 329
Nemas, plant parasitic, effect of arsenic compounds on 70
Nematoda, as parasites of Amphibia 1
Nematoda, revised classification of 131
Nematode, from *Lynx canadensis* 63
Nematode, passive transfer of immunity to an intestinal infection with 333
Nematodes, fish, changes in generic position of 104
Nematodes, parasitic, in vitro consumption of oxygen by 128
Nematodes, plant infesting, length of dormancy in 104
Nematodes, some saprophytes or semi-parasitic, infesting plants 63
Nematodes, time of survival of larvae on pastures 107
Nematodirella longispiculata in *Antilocapra americana* 107
Nemic genera and species, N. A. Cobb 81
Neocolpocephalum, new name for Mallophagan genus *Ferrisia* 65
New genera described in this volume:
Angustinema 83
Antopus 82
Cenolaimus 84
Cryptolaimus 85
Cyanthonchus 83
Dasylaimus 89
Denticulella 89
Desmodorella 92
Dispira 87
Dispirella 87
Halalaimoides 83
Halenchus 94
Linolaimus 86
Macrogynium 270
Neonyx 90
Neotonchus 86
Nunema 90
Nygmatonchus 90
Pristionema 93
Pteronium 93
Pulchranemella 84
Rhabdonchus 94
Sigmophora 92
Synonchiella 88
Tubolaimella 82
Tylocephalus 106
New species described in this volume:
Acanthatrium molossidis from *Molossus sinaloae* 335
Agamodistomum norvegicum from *Epimys norvegicus* 250
Alaria canis from *Canis familiaris* 335
Angustinema nudum 83
Aplectana sp. from *Hynobius fuscus* 18
Atractis sp. from *Bufo variabilis* 24
Basilia boardmani from *Myotis austroriparius* 315
Cenolaimus supersentiens 84
Cercaria sphaerula from *Helisoma trivolvis* 285
Cercariaeum nephroplexus from *Helix albolabris* 335
Crepidostomum brevivitellum from *Anguilla rostrata* and *Lota maculosa* 295
Cryptolaimus cylindricollis 85
Cryptolaimus pellucidus 86

Cyanthonchus tenuicaudatus 84
Dasylaimus nudus 89
Denticulella pellucida 89
Desmodorella cephalata 93
Dicrocoelium lasiuri from *Lasiurus borealis* 137
Dispira punctata 87
Dispirella truncata 88
Eimeria mustelae from *Mustela vison* 252
Halalaimoides acuminata 83
Linolaimus quadricoma 86
Macrogynium ovalis from *Stichopus* 270
Naobranchia wilsoni from *Diodon hystrix* 138
Neonyx alatus 92
Neonyx campycoma 91
Neonyx cancellatus 91
Neotonchus punctatus 87
Nunema nanum 90
Nyctotherus cheni from *Rana spinosa* 122
Nygmatonchus scriptus 90
Ophioptes tropicalis from *Erpetodryas carinatus* 55
Oxysomatium baylisi from *Ceratophrys dorsata* 22
Oxysomatum sp. from *Rana limnocharis* 23
Plagitura parva from *Triturus viridescens* 134
Plasmodium polare from *Petrochelidon lunifrons lunifrons* 334
Pristinonema octalata 93
Pteronium obesum 94
Pulchranemella setosa 85
Rhabdonchus cephalatus 94
Sigmophora rufum 92
Sphyranura oligorchis from *Necturus maculosus* 140
Synonchiella denticulata 88
Synonchiella ferox 88
Synonchiella truncata 88
Taenia asiota from *Otus asio* 327
Tubolaimella setosa 82
Tylocephalus bacillivorus 106
Nigrelli, R. F., *Naobranchia wilsoni,* new copepod from *Diodon hystrix* 138
Nigrelli, R. F., and C. M. Breder, Jr., Susceptibility and immunity of certain marine fish to *Epibdella melleni* 136
Nigrelli, Ross F., and Charles M. Breder, Jr., Susceptibility and immunity of marine fishes to *Epibdella melleni* 259
Nigrelli, R. F., and H. W. Stunkard, *Sterrhurus* sp., a hemiurid from the gills of the cutlass fish 136
Nippostrongylus larvae, reaction of laboratory rats to graded numbers of .. 128
Nippostrongylus muris, resistance of rats to superinfection with 326
Nippostrongylus muris, strains in various strains of rats 323
Nippostrongylus muris, vitamin A and resistance of rats to 72
Nolf, L. O. and W. W. Cort, Immunity reactions of snails to penetration of cercariae of *Cotylurus flabelliformis* 38
Nycteribiid, new, from Florida 315
Nyctotherus, new species from Chinese frog 122

Oesophagostomum dentatum, development in guinea-pig and rabbit 73
Oesophagostomum dentatum, effect of ferrous sulphate and copper sulphate on resistance of pigs to 325
Oestrus ovis, conjunctival ophthalomyiasis caused by 337
Oliver-González, R. (see Bachman, Rodriquez-Molina and Oliver-González) 146

Oochoristica, species of the genus ... 181
Ophiotaenia saphena, life cycle of ... 291
Ostertagia circumcincta, development of pre-parasitic larval stages of ... 63
Ostertagia circumcincta, life history of ... 107
Ostertagia, localization in host ... 65
Otto, G. F. (see Porter and Otto) ... 323
Otto, G. F., Blood picture of children in Louisiana ... 142
Otto, G. F., and W. W. Cort, Post-treatment reinfection with ascaris in the United States ... 245

Paramecium caudatum, culture free from living microorganisms ... 33
Paramphistomum cervi, new snail hosts for ... 108
Parasites, of ciscoes, non-specific immunity between ... 244
Parasites, dissections of chordates for ... 76
Parasites, equine, from Puerto Rico ... 110
Parasites, intestinal, oxidation-reduction potential in growth of, in vitro ... 129
Parasites, of 150 students in District of Columbia ... 338
Parasitic infections, cellular bases for immune reactions in ... 149
Parasitic worms, polyandry and polygamy in ... 141
Parasitology, viewpoints and orientation in ... 334
Paraspidodera uncinata, the guinea-pig nematode ... 323
Phagicola, new host records for ... 111
Philip, Cornelius B., Epizootic tick-borne tularaemia in sheep in Montana ... 338
Pilsbry, H. A., Note on the genus *Blanfordia* ... 282
Piroplasma canis, in Florida ... 312
Plagitura parva, life cycle of ... 135
Plagitura parva, n. sp., from *Triturus viridescens* ... 134
Plagitura salamandra, variations in ... 324
Plasmodium cathemerium, effect of quinine upon reproduction of ... 139
Porter, D. A. and G. F. Otto, The guinea-pig nematode, *Paraspidodera uncinata* ... 323
Porter, Dale A. (see Graham and Porter) ... 323
Pote, T. B., Ova of *Diphyllobothrium latum* in Esquimo mummy from Greenland ... 133
Price, E. W., New host records for trematodes of genus *Phagicola* ... 111
Price, E. W., Note on genus *Schistoma* ... 111
Price, E. W., What is *Ascocotyle plana* Linton? ... 110
Prince, F. M. (see Hull, Dove, and Prince) ... 162
Proteocephalus ambloplites, plerocercoid larva of ... 132
Protonematode, characters of ... 130
Protozoa, from intestines of chimpanzees ... 143
Protozoa, intestinal, diagnosis from purged and normally passed stools ... 253
Protozoan parasites, of Orthoptera ... 125
Protozoological survey, of 700 college freshmen ... 141
Prouty, Margaret Jo. and G. Robert Coatney, Biology of the pigeon fly, *Pseudolynchia maura* ... 139
Pseudolynchia maura, biology of ... 139

Raffensperger, H. B. (see Schwartz, Raffensperger, and Spindler) ... 129
Ratcliffe, Herbert L. and Quentin M. Geiman, Amoebiasis in reptiles ... 139
Ratcliffe, Herbert L. and Quentin M. Geiman, Experimental amebic infection in reptiles ... 328
Research notes, publication in Journal of Parasitology ... 201
Retortamonas, four races of ... 331
Rhabdometra odiosa from *Pedioectes phasianellus* ... 313
Rodríquez-Molina, R. (see Bachman, Rodríquez-Molina, and Oliver-González) ... 146

Root, Francis M., Abnormal parabasal spines in male hypopygium of *Anopheles pseudopunctipennis* ... 315
Root, Francis Metcalf (Obituary) ... 342
Rotifer, pathogenic in man, apparent case of ... 133
Rozeboom, L. E., A new nycteribiid from Florida ... 315
Rozeboom, L. E. and K. S. Shaw, Production of bird malaria by injection of sporozoites ... 198

Sand flies, control of ... 337
Sand fly larvae, seasonal incidence and concentrations in salt marshes ... 162
Santonin, for intestinal helminths of dogs ... 112
Sarles, Merritt P., Resistance of cat to ascaris infection ... 126
Scott, J. Allen, Epidemiology of hookworm disease in Palestine ... 146
Scott, J. Allen, Helminth egg counts plotted on a logarithmic scale ... 145
Schaffer, J. M. (see Wright and Schaffer) ... 114
Schistosoma japonicum, molluscan intermediate host of, in the Philippines. 280
Schistosoma mansoni, molluscan phase of the life cycle of ... 131
Schistosoma, note on ... 111
Schwartz, Benjamin and Joseph E. Alicata, Development of *Ancylostoma caninum* following percutaneous infection ... 326
Schwartz, Benjamin, H. B. Raffensperger, and Lloyd A. Spindler, Control of swine kidney worm ... 129
Seamans, Frank M., Protozoan parasites of the Orthoptera ... 125
Seurocynrea colini, life history of ... 98
Shaw, C. Ruth, *Diplostomulum* of *Triturus viridescens* ... 132
Shaw, K. S. (see Rozeboom and Shaw) ... 198
Sherman, Grace W., Effect of hotwater treatment upon *Tylenchus dipsaci.* 71
Sherman, Grace W., Number of *Tylenchus dipsaci* in a narcissus leaf ... 112
Skidmore, Louis V., Bovine coccidia carriers ... 126
Skidmore, Louis V., Incidence of coccidia in common English sparrow ... 331
Snails, toxic effect of copper for ... 109
Spindler, L. A., Effect of ferrous sulphate and copper sulphate on resistance of pigs to *Oesophagostomum dentatum* ... 325
Spindler, L. A., Resistance of rats to superinfection with *Nippostrongylus muris* ... 326
Spindler, L. A., Skin penetration tests with larvae of *Stephanurus dentatus.* 76
Spindler, L. A., Vitamin A and resistance in rats to *Nippostrongylus muris.* 72
Spindler, Lloyd A. (see Schwartz, Raffensperger and Spindler) ... 129
Sphyranura oligorchis from *Necturus maculosus* ... 140
Sphyranura oligorchis, life cycle of ... 140
Sphyranura oligorchis, lymph system of ... 327
Spirocerca sanguinolenta, status of ... 69
Spirochaeta lagopodis, in blood of willow grouse ... 97
Stabler, R. M., Amoeba parasitic in *Zelleriella* ... 122
Stabler, R. M. (see Wenrich, Stabler, and Arnett) ... 141
Steiner, G., *Cylindrogaster longistoma* and its relationship ... 66
Stephanurus dentatus, skin penetration tests with larvae of ... 76
Sterrhurus sp., from gills of cutlass fish ... 136
Stoll, Norman R., When are ascaris eggs infective? ... 126
Strongyloides, ingestion of eggs and larvae of, by ciliates ... 313
Strongyloides, interrelations of parasite and host-tissue in experimental infection with ... 333
Stunkard, H. W., Friedrich Fülleborn ... 203
Stunkard, H. W., Life cycle of *Plagitura parva* ... 135
Stunkard, H. W., Life cycle of *Typhlocoelum cymbium* ... 336
Stunkard, Horace W., Life history of *Himasthla quissentensis* ... 336
Stunkard, H. W., *Plagitura parva* n. sp. from *Triturus viridescens* ... 134

Stunkard, H. W. and F. W. Dunihue, *Gyrodactylus* as a parasite of tadpoles of *Rana catesbiana* 137
Stunkard, H. W. (see Negrelli and Stunkard) 136
Swales, W. E., *Rhabdometra odiosa* from *Pedioectes phasianellus* 313
Swezey, W. W. and F. O. Atchley, Ingestion of eggs and larvae of *Strongyloides* by intestinal ciliates 313

Taenia asiota n. sp., from screech owl 327
Taenia confusa, validity of 207
Taenia hydatigenea, with six suckers 57
Taliaferro, William Hay (photograph) 149
Taliaferro, William Hay, Some cellular bases for immune reactions in parasitic infections 149
Tetrameres pattersoni, life history of 97
Thomas, Lyell J., *Cercaria sphaerula* n. sp., from *Helisoma trivolvis* infecting cyclops 285
Thomas, Lyell J., Life cycle of frog tapeworm *Ophiotaenia saphena* 291
Thomas, Lyell J. and Arthur Dean Johnson, Life cycle of *Halipegus occidualis* 327
Ticks, from tapirs of Panama 312
Toxocara canis, vitamin A deficient diet and development of 79
Trematodes, ecto-parasitic of Puget Sound fishes 324
Trematodes, germ cell cycle in 325
Trematodes, of the common bullhead 136
Trichinella spiralis, antigen in other disease conditions 146
Trichinae, development of adult in chick and rat embryos 333
Trichiniasis, artificial immunization of rats against 142
Trichomonas hominis, from man, infections of vagina of Rhesus monkeys with 247
Trichomonas hominis, passage through monkey 199
Trichomonas vaginitis 330
Trichomonas vaginalis, structure of 121
Trichomonas vaginalis, transmission to kittens 124
Trichostrongylus tenuis, infestations in domestic and game birds in United States 128
Tsuchiya, H., Amoebastatic properties of dyes upon *Endamoeba histolytica* in vitro 143
Tsuchiya, H., Cultivation of *Endamoeba histolytica* 143
Tsuchiya, H., Starch-charcoal mixture in cultivation of *Balantidium* 144
Tularaemia, tick-borne in sheep in Montana 338
Turbellaria, new genus and species from sea cucumber 270
Tylenchus dipsaci, effect of derris extract and rotenone upon 74
Tylenchus dipsaci, effect of hot water treatment on 71
Tylenchus dipsaci, new host of 65
Tylenchus dipsaci, number in a narcissus leaf 112
Tylocephalus bacillivorus n. g., n. sp., life history and morphology of 106
Typhlocoelum cymbium, life cycle of 336
Tyzzer, E. E., Viewpoints and orientation in parasitology 334

Underwood, Paul C., Case of *Dirofilaria immitis* in Virginia dog 77
Underwood, Paul C., Effect of N-Butylidene Chloride on colts infested with ascarids 77
Underwood, Paul C., Occurrence of *Dirofilaria immitis* and intestinal helminths in Virginia dogs 112
Underwood, Paul C., Santonin for intestinal helminths of dogs 112
Underwood, Paul C. and Willard H. Wright, Periodicity of *Dirofilaria immitis* larvae in dogs 113

Unionicola aculeata, in snails in North Carolina 312
Uranotaenia spp., in Louisiana 339

Van Cleave, Harley J., Status of certain genera of Acanthocephala, chiefly from birds 324

Walton, A. C., Nematoda as parasites of amphibia 1
Ward, H. B., surprise party in honor of 60
Warble, injuries to reindeer hides 138
Warbles, migration in reindeer 138
Wehr, E. E., *Amidostomum spatulatum* in the United States 68
Wehr, E. E., *Echinura spinosa,* male of genus *Tetrameres* 113
Wehr, E. E., Is *Echinurioides* a good genus? 78
Wenrich, D. H., R. M. Stabler and J. H. Arnett, Protozoological survey of 700 college freshmen 141
White, G. F., Production of maggots for surgical use 338
Wichterman, Ralph, New species of *Nyctotherus* from a Chinese frog 122
Willey, Charles H., Resistance of terns to *Cryptocotyle lingua* 135
Wilmoth, J. H. (see Ackert, Eisenbrandt, Glading, and Wilmoth) 127
Wilmoth, J. H. (see Ackert and Wilmoth) 323
Wilson, F. H., Life cycle and bionomics of *Lipeurus heterographus* 304
Woodhead, Arthur E., Germ cell cycle in trematodes 325
Woodhead, Arthur E., Reproduction in *Leucochlocidium* 336
Woodhead, Arthur E., Spermatogenesis in gasterostomes 336
Worden, J. L. (see Giesen and Worden) 130
Wright, W. H., Vitamin A deficient diet and development of *Toxocara canis* in dogs 79
Wright, W. H. and J. M. Schaffer, Anthelmintic efficacy of primary monobrom hydro-carbons for *Ancylostoma caninum* 114
Wright, Willard H. (see Underwood and Wright) 113

Yakimoff, W. L. and W. F. Gousseff, Coccidia of martens and sables 251
Yellow fever virus, attempt to transmit by dog fleas and flies 299